BROADWAY PROPER REDEVELOPMENT PLAN

CITY OF TUCSON
PLANNING DEPARTMENT

OCTOBER 1984

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Adopted by Mayor and Council - October 22, 1984 - Resolution 12910

FORMAL ACTION

Mayor and Council:
September 10, 1984 - Resolution No. 12867 (Blight Declaration)
October 22, 1984 - Resolution No. 12910 (Adoption)

HEARINGS

Mayor & Council:
October 22, 1984

BROADWAY PROPER REDEVELOPMENT PLAN

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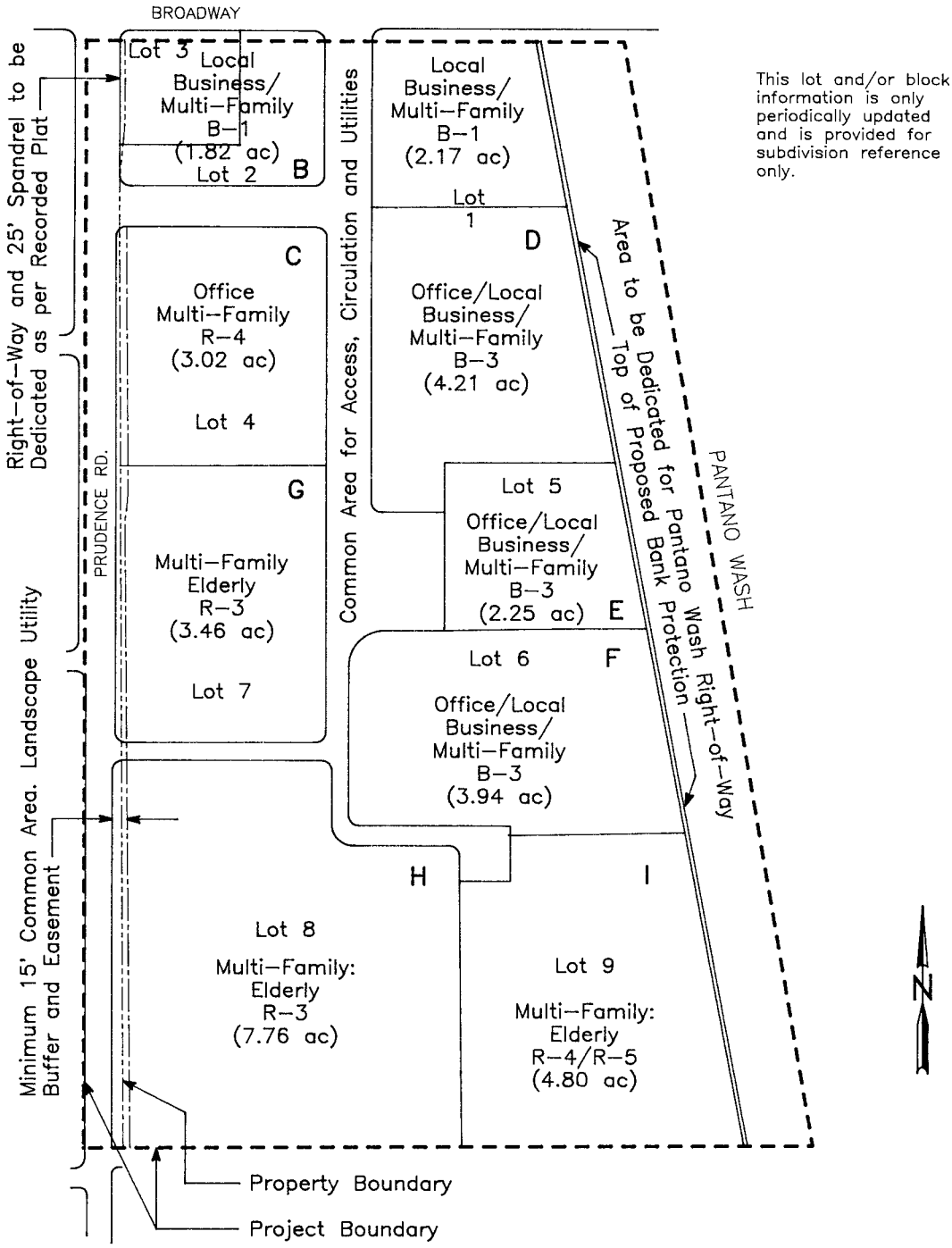


This lot and/or block information is only periodically updated and is provided for subdivision reference only.

Broadway Proper Redevelopment Plan

Subdivision Lot Numbers And Location Map

Profile

The *Broadway Proper Redevelopment Plan* encompasses a 40 acre land parcel located at the southwest corner of Broadway and the Pantano Wash. It extends west from the wash to Prudence Road and south from Broadway to the Gollob Park/YMCA parcels.

Purpose

Much of the project site is located on an old Solid Waste Disposal Site (SWDS). The SWDS has been inactive for many years, however, hazards such as gas generation and off-site migration common to closed landfills, were present. It was evident that restoration of the site was necessary. The *Redevelopment Plan* served as a blight mitigation plan and a land use plan designed to foster the economic growth potential of the redevelopment area by providing intense development common in Activity Centers, as well as make available financing tools to assist in elimination of the blighted conditions.

Plan Background

Lying adjacent to the Pantano Wash on the outskirts of the City limits, the 40 acre parcel was the site of major aggregate extraction operations and eventually served as a municipal landfill (solid waste disposal site, SWDS). The City expanded and virtually developed around the active SWDS. After termination of this use the land remained vacant until the *Broadway Proper Redevelopment Plan* was adopted.

The *Plan* was a joint effort by private land owners and public agencies to mitigate the hazards commonly related to old SWDS'S. Successfully returning the site to a safe and stable condition by eliminating threats to public health and safety, the *Plan* facilitated installation of bank protection for the Pantano Wash and correction of surface drainage in conjunction with the placement of a methane gas collection system and barrier around the perimeter of the *Plan* boundary.

Previously the land parcel was considered undevelopable. However, due to the positive results of the mitigation efforts, the land parcel was subdivided and opportunities for the development of a mix of uses to serve the community were provided. On the remaining vacant lots, the *Plan* permits multi-family, office, commercial and medical related development.

I

DEFINITIONS

A. Activity Center. A Part of the City of Tucson identified in the *General Plan*[*] as an area where high-intensity mixed-use development is permitted and/or encouraged. Other examples: University of Arizona, Tucson Municipal Airport Environs.

B. Broadway Proper. A mixed-use, phased development project in the East Broadway activity center, comprised of one element east of Pantano Wash and the 48-acre redevelopment project area between Pantano Wash and Prudence Road.

C. Development Areas. Components of Broadway Proper for which specific types of uses have been identified and to which specific land use controls and restrictions have been applied. Alternative definitions: site or parcel.

D. Redeveloper. The land owner, his heirs, successors and assigns, who undertakes the physical construction of site improvements and buildings in Broadway Proper subject to the controls and restrictions of the *Redevelopment Plan* and the City of Tucson.

E. Redevelopment Plan. A legal document prepared pursuant to A.R.S. 36-1471 et. seq., and adopted by the Mayor and Council following notice and public hearing, setting forth goals, concepts, standards, terms and conditions for the redevelopment of a specified blighted land area.

F. Floor Area. The sum of the gross horizontal areas of the several floors of all buildings, including accessory buildings on a lot, measured from the exterior faces of the exterior walls or from the centerline of walls separating two buildings, and shall include elevator shafts and the stair wells at each story, floor space with structural head-room of six feet, six inches or more used for mechanical equipment, penthouses, attic space, interior balconies, mezzanines and enclosed porches, but shall not include any interior space used for parking, loading or loading spaces.

G. Floor Area Ratio. The result of dividing the floor area of a building (in square feet) by the square footage of the development area or parcel on which it is to be constructed. A measure for comparative purposes, of the intensity of the use of land.

H. Site Area. The land area in acres or square feet within the then existing boundaries of a development area or parcel.

I. Lot Coverage/Building Coverage. The ratio, expressed as a percentage, of the amount of land covered by a building divided by the site area.

J. Master Methane Control Plan. A document identifying conditions of methane gas generation from existing solid waste disposal sites within the redevelopment project

[*] *The General Plan* was originally adopted as the "*Comprehensive Plan*" pursuant to the Tucson *Zoning Code* and, subsequently, the Tucson *Land Use Code*. The term "Comprehensive Plan (CP)" was changed to the "General Plan" by Ordinance 9517, which was adopted by Mayor and Council on February 12, 2001. This change in title does not affect the content of the Plan.

area, discussing alternative means and systems to control methane gas generation and/or migration, defining monitoring procedures and setting forth organization and responsibilities for system installation and operation.

II

BOUNDARIES OF THE BROADWAY PROPER REDEVELOPMENT PROJECT

The boundary of the project area is described in "Exhibit A" attached hereto. It is also shown on "Exhibit B," Map of Existing Land Uses and Conditions of Real Property. The Location Map, "Exhibit A-1" defines the project in the context of the surrounding area.

III

EXISTING LAND USES AND CONDITIONS OF THE REAL PROPERTY THEREIN

Existing land uses, building conditions and site conditions are described in "Exhibit B" attached hereto and made a part hereof.

IV

REDEVELOPMENT PLAN OBJECTIVES AS THEY RELATE TO DEFINITIVE LOCAL OBJECTIVES

Objectives of the *Redevelopment Plan* for this project area, as they relate to definitive local objectives regarding appropriate land uses, provision of housing to meet special needs, elimination of threats to public health and safety, reduction of municipal and county expenditures and fostering of economic growth in the community and the proposed land uses and building requirements in the redevelopment project area, include the following:

A. To conform with the *General Plan* for the City of Tucson with respect to land use, including intensified development in "activity centers".

B. Through cooperation between the public and private sectors, to encourage provision of housing to meet the special needs of the elderly, the disabled and low and moderate income families and individuals.

C. To support joint efforts of other public agencies, private land owners and City departments in restoring former solid waste disposal sites (SWDS) to a safe and stable condition through the encouragement of appropriate and compatible uses, coupled with facilities and operating programs designed to mitigate environmental hazards.

D. To augment community-wide recreational resources by implementing a system of "riverpark" pedestrian and bicycle pathways in landscaped public access easements along major washes per the "Parks Element" of the Parks, Recreation and Open Space Plan.

E. To encourage excellence of design and provision of publicly accessible, landscaped open spaces.

F. To demonstrate design and construction techniques which promote efficient energy usage.

V

LAND USE PLAN SHOWING PROPOSED USES OF THE AREA

The *Land Use Plan* is shown as "Exhibit C" and is supplemented by a *Concept Plan* attached as "Exhibit D". Both exhibits are attached and are made part of this *Redevelopment Plan*. These exhibits are made deliberately general to provide flexibility in land use and structural design to owner participants, subject to administrative and development plan review procedures. This will ensure the substantial attainment of *Redevelopment Plan* objectives, including excellent design quality, provision of coordinated and landscaped pedestrian ways, and proper spatial relationships between buildings. "Exhibit E" is an illustrative site plan intended to express design quality objectives and to illustrate detailed concepts.

VI

STANDARDS OF POPULATION DENSITIES, LAND COVERAGE AND BUILDING INTENSITIES IN THE AREA AFTER REDEVELOPMENT

Land uses and building requirements will be governed in the project area by the OCR-1 Office/Commercial/Residential Zone (B-3 Business Zone) (City of Tucson *Land Use Code*), the C-1 Commercial Zone (C-1 (B-1) Business Zone) (City of Tucson *Land Use Code*), the OCR-2 Office/Commercial/Residential Zone (R-5 Residential Zone) (City of Tucson *Land Use Code*), the O-3 Office Zone (O-3 (R-4) Residential Zone) (City of Tucson *Land Use Code*), as shown on "Exhibit C" and by the R-3 Residential Zone (City of Tucson *Land Use Code*).

Such zoning shall be further restricted by development standards set forth in this *Redevelopment Plan* and shall be subject to development plan review of proposed development in each subarea.

The permitted uses in areas designated in "Exhibit C" as "Office/Local Business" shall be: commercial, professional and public offices; financial institutions; multi-family residential; supporting retail and service uses including restaurants, specialty shops and personal service establishments; transient accommodations; and similar uses.

The permitted uses designated in "Exhibit C" as "Local Business," "Multi-Family" and "Office/Multi-Family" shall be those uses permitted by the provisions of the applicable zoning district in accordance with the appropriate section of the City of Tucson *Land Use Code*. It is the goal, although not the specific requirement of this *Plan*, that areas developed for multi-family uses be devoted to provision of housing for the elderly, including apartments for rent plus such appurtenant uses as are necessary to serve the needs of elderly tenants, including but not limited to recreational facilities; socialization areas; building space for instruction in arts, crafts, fitness and other subjects; therapy facilities; health care and diagnostic facilities; food

preparation, service and dining areas, and similar facilities related to maintaining a safe and comfortable living environment.

More specifically, the *Plan* proposes to achieve the following:

A. Land Use

1. Principal Land Uses

Note: Certain bldg. heights were not approved by Mayor and Council during the rezoning. Please refer to rezoning case for specifics.

Broadway Proper is divided into two major land-use components: a residential component and an office/local business component. The residential component, in the southerly and southeasterly sectors of the project, contains three subareas of multifamily housing at approximately the same land-use intensity of 35 to 45 units per acre. The office/local business component will develop at low to medium land-use intensity along the Broadway and Prudence Road frontage, while a high-intensity subarea accommodating midrise (up to seven stories) and high-rise (eight stories and up) buildings will develop in the east central portion of the site, adjoining the Pantano Wash and with access from an internal roadway system.

Each subarea of the residential component is to be developed with a different housing product type responding through design to different levels of needs of the resident population. Along Prudence Road, 150 to 200 units will be developed as apartments featuring additional storage, special kitchen and bathroom features, and small guest bedrooms for some units. In the second subarea in the southwesterly sector of the project, there will be a common lobby/lounge plus shared indoor and outdoor recreational areas to accommodate YMCA programs and activities. Multifamily housing in the third subarea will be in taller buildings along the bank of the Pantano Wash and will feature other specialized facilities for recreation, socialization and health maintenance.

Primary land-use objectives along the Broadway frontage portion of the office/local business component include a financial institution at the southeast corner of Broadway and Prudence and a sit-down restaurant or similar high-identity service or retail use at Broadway and the Pantano Wash. In the event of strong market support for a hotel/motel, such a use might extend from the Broadway frontage into the high-intensity core subarea along the Pantano Wash. The office site along Prudence Road is anticipated to be developed for general office uses.

Buildings in the high-intensity core--predominantly office with associated service and retail uses--will be mid to high-rise with or

without structural parking. While eventual development of such uses is a goal of this *Redevelopment Plan*, it is not anticipated that they occur until latter stages of redevelopment. The high-intensity use of this subarea is required to offset some of the extraordinary costs of development on a solid waste disposal site (see Exhibit "H") and to bring the entire project into economic balance.

2. Alternative Land Uses

The alternative land use for each parcel designated for commercial or office use is multifamily residential at densities set forth in the Development Standards, Section V, C. The sector of the office/local business component at Broadway and the Pantano Wash--including part of the high-intensity core area--might be developed for hotel/motel uses with associated restaurants and recreational facilities, and within a shorter time frame. Other uses permitted in the zoning districts applicable to each of the sites are regulated and restricted through the development standards of this *Redevelopment Plan* and may be further restricted by recorded covenants, conditions and restrictions benefiting parties other than the City of Tucson.

3. Land Use/Design Concept

The design concept for *Broadway Proper*, which has also in part determined the choice of appropriate land uses, is strongly influenced by the characteristics of land and land use along its boundaries. It is the intent of the concept and plan not to crowd structures along the Prudence Road frontage across from an existing single-family residential neighborhood, but instead to set any structures over two stories back from the roadway a sufficient distance - 60 to 100 feet -so that they will have the same or nearly equivalent apparent scale as if the site were developed along its edge with detached single-family residences. The concept is augmented by the intent of the *Plan* to establish a broad landscaped buffer (including berm and wall) along Prudence Road in order to further diminish visual perception of development from the exterior of the site.

The south boundary of the site abuts the City's Gollub Park and the East Side YMCA. Buildings 36 to 40 feet in height adjoining the YMCA property and up to 75 feet in height adjacent to the park are deemed compatible, subject to provision of a landscaping edge along the south boundary to achieve a visual transition between the uses.

Development along the Broadway frontage of the site is not sought to be maximized but rather to be open and uncrowded in order to provide a visual corridor and accessway to the central portion of the property--the core area. Accordingly, development would occur generally at only the northwest and

northeastern corners, with much of the frontage remaining open and used for parking, circulation and landscaping.

The Pantano Wash frontage is separated from adjoining properties under other ownership either by the Wash itself or by significant buffers of lower-intensity development within the *Broadway Proper Redevelopment* area. This also has the effect of diminishing the apparent scale of development when viewed from offsite.

"Exhibit D" illustrates these concepts graphically. These concepts are intended in general to be used as guidelines by design professionals in the preparation of construction plans in the various subareas.

4. Amenities

Exhibits E-1, 2, 3, and 4 graphically portray landscaping concepts in Broadway Proper. Plant materials will be drought tolerant and selected for adaptability to planting in shallow soil. The buffer along Prudence is intended to provide a compatible and attractive interface with the adjoining neighborhood. Along the south boundary, landscaping designs will be prepared in conjunction with the Parks and Recreation Department and the YMCA, with provision of pedestrian connections between Broadway Proper and Gollub Park and the YMCA. Proposed improvements in this linear park connection will comply with goals, policies and design approved by the Parks and Recreation Department. The YMCA has agreed to operate programs and activities within multi-family complexes in Broadway Proper, and the redeveloper has agreed to make requisite facilities available to the YMCA. The linear "riverpark" along the Pantano Wash will be accessible to the public, project residents and YMCA members.

B. Population Densities

The 600-650 units of housing will vary in density according to subarea and housing type. Approximately 1000 residents are projected at full buildout. Non-residential daytime population - employees and visitors -is projected at 2000 persons. The average daytime population density on the site's 44 developed acres will be approximately 68 persons per acre.

C. Land Coverage and Building Intensities

The following Development Standards shall apply as additional restrictions to be adopted as part of this *Redevelopment Plan* and as conditions to the rezoning of each development area in Broadway Proper, as shown in "Exhibit C":

Development Area A (2.17 acres)

1. Zoning: C-1 (C-1 (B-1))

2. Primary Uses Permitted: Local business uses.
   Alternative Uses Permitted: Multifamily residential not to exceed 40 dwelling units per net acre and subject to O-3 (O-3 (R-4)) zoning restrictions.

   Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

   a. Minimum Building Setback from Existing Public Street Right-of-Way: 30 feet

   b. Maximum Building Height: 30 feet

   c. Maximum Building Coverage: 50% of site area

   d. Maximum Floor Area Ratio: 0.5

   e. Minimum Landscaping Coverage: 10% of site area

   f. Special Landscaping Requirements: The setback area along Broadway shall be landscaped with earthen mounds or berms, ground cover and planting with drought-resistant tree and shrub species. Surface parking may occupy up to 20 feet along no more than 50 percent of the street frontage in this setback area, provided it is screened by a berm or dense landscape planting.

Development Area C-1 (B-1) and B-2 (1.82 acres)

1. Zoning: C-1 (B-1)

2. Primary Uses Permitted: Local business uses.
   Alternative Uses Permitted: Multifamily residential not to exceed 40 dwelling units per net acre and subject to the Residential Development Option in the C-1 (B-1) Zone.

   Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

   a. Minimum Building Setback from Existing Public Street Right-of-Way: 30 feet

   b. Maximum Building Height: 30 feet

   c. Maximum Building Coverage: 50% of site area

   d. Maximum Floor Area Ratio: 0.5

   e. Minimum Landscaping Coverage: 10% of site area

   f. Special Landscaping Requirements: Setback areas along Broadway and Prudence Road shall be landscaped with earthen mounds or berms, ground cover and planting with drought-resistant tree and shrub species. Surface parking may occupy up to 20 feet along no more than 30 percent of the street frontage of this setback area, provided it is screened by a berm or dense landscape planting.

Development Area C (3.02 acres)

1. Zoning: O-3 (R-4)

2. Primary Uses Permitted: Business and professional offices.
   Alternative Uses Permitted: Multifamily residential not to exceed 40 dwelling units per net acre and subject to O-3 (R-4) zoning restrictions.

   Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

   a. Minimum Building Setback from Existing Public Street Right-of-Way: 80 feet

   b. Maximum Building Height: 36 feet, with 80 foot setback from Prudence Road; 40 feet with 100 foot average setback from Prudence Road.

   c. Maximum Building Coverage: 35% of site area

   d. Maximum Floor Area Ratio: 1.0

   e. Minimum Landscaping Coverage: 10% of site area

f. Special Landscaping Requirements: The setback area along Prudence Road shall be landscaped with earthen mounds or berms, fences or walls, ground cover and planting with drought-resistant tree and shrub species. The landscaped area shall be a minimum of 30 feet in width (up to 15 feet of right-of-way may be included, subject to approval by the City Engineer). If less than 15 feet is approved by the City Engineer, then the difference in footage must be made up onsite within this landscaped area.

Development Area D (4.21 acres)

1. Zoning: OCR-1 (B-3)

2. Primary Uses Permitted: Local business uses.
Alternative Uses Permitted: Multifamily residential not to exceed 60 dwelling units per net acre and subject to OCR-2 (R-5) zoning restrictions.

Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

a. Maximum Building Height: 7 stories or 75 feet

b. Maximum Building Coverage: 30% of site area

c. Maximum Floor Area Ratio: 1.0

d. Minimum Landscaping Coverage: 10% of site area

Development Area E (2.25 acres)

1. Zoning: OCR-1 (B-3)

2. Primary Uses Permitted: Local business uses.
Alternative Uses Permitted: Multifamily residential not to exceed 80 dwelling units per net acre and subject to OCR-2 (R-5) zoning restrictions.
Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

a. Maximum Building Height: 140 feet

b. Maximum Building Coverage: 30% of site area

c. Maximum Floor Area Ratio: 3.0

d. Minimum Landscaping Coverage: 10% of site area

Development Area F (3.94 acres)

1. Zoning: OCR-1 (B-3)

2. Primary Uses Permitted: Local business uses. Alternative Uses Permitted: Multifamily residential not to exceed 60 dwelling units per net acre and subject to OCR-2 (R-5) restrictions.

   Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

   a. Maximum Building Height: 75 feet

   b. Maximum Building Coverage: 30% of site area

   c. Maximum Floor Area Ratio: 1.0

   d. Minimum Landscaping Coverage: 10% of site area

Development Area G (3.46 acres)

1. Zoning: R-3

2. Primary Uses Permitted: Multifamily residences

   Conditional Uses Permitted: None

3. General Development Standards:

   a. Minimum Building Setback from Existing Public Street Right-of-Way: 80 feet

   b. Maximum Building Height: 36 feet with 80 foot setback from Prudence Road; 40 feet with 100 foot average setback from Prudence Road.

   c. Maximum Building Coverage: 25% of site area

   d. Maximum Floor Area Ratio: 0.75

e. Minimum Landscaping Coverage: 10% of site area

f. Special Landscaping Requirements: The setback along Prudence Road shall be landscaped with earthen mounds or berms, fences or walls, ground cover and planting with drought-resistant tree and shrub species. The landscaped area shall be a minimum of 30 feet in width (up to 15 feet of right-of-way may be included, subject to approval by the City Engineer). If less than 15 feet is approved by the City Engineer, then the difference in footage must be made up onsite within this landscape area.

Development Area H-1 and H-2 (7.76 acres)

1. Zoning: R-3

2. Primary Uses Permitted: Multifamily residences plus food and recreational services

   Conditional Uses Permitted: None

3. General Development Standards:

   a. Minimum Building Setback from Existing Public Street Right-of-Way: 50 feet

   b. Maximum Building height: 36 feet

   c. Maximum Building Coverage: 25% of site area

   d. Maximum Floor Area Ratio: 0.75

   e. Minimum Landscaping Coverage: 20% of site area

   f. Special Landscaping Requirements: The setback along Prudence Road shall be landscaped with earthen mounds or berms, fences or walls, ground cover and planting with drought-resistant tree and shrub species. The landscaped area shall be a minimum of 30 feet in width (up to 15 feet of right-of-way may be included, subject to approval by the City Engineer). If less than 15 feet is approved by the City Engineer, then the difference in footage must be made up onsite within this landscape area.

Development Area I (4.80 acres)

1. Zoning: O-3 (R-4), OCR-2 (R-5) Restricted

2. Primary Uses Permitted: Multifamily Residences and nonhousekeeping rooms, plus food and health services.

   Conditional Uses Permitted: None

3. Accessory Buildings Permitted: None

4. General Development Standards:

   a. Maximum Building Height: 75 feet

   b. Maximum Building Coverage: 20% of site area

   c. Maximum Floor Area Ratio: 1.0

   d. Minimum Landscaping Coverage: 10% of site area

D. Building Codes and Ordinances

All applicable building codes of the City of Tucson shall be in effect during the life of the project. All applicable ordinances shall likewise govern, subject to variance procedures. Policies and/or regulations of the City of Tucson, Pima County and the State of Arizona, with respect to SWDS hazard mitigation procedures shall be adhered to throughout the development program and subsequent maintenance and operational phases, subject to negotiated definition of specific requirements pursuant to the recommendations of a registered professional engineer(s).

E. State and Federal Regulations

All applicable State and Federal regulations in effect at the time of implementation of any phase of development of this project shall be complied with as it regards that phase and any remaining undeveloped areas.

VII

PROPOSED CHANGES IN ZONING ORDINANCES AND MAPS, STREET LAYOUTS, STREET LEVELS AND GRADES, BUILDING CODES AND ORDINANCES

A. Zoning Changes

Existing zoning on the site is "UR-Urban Ranch," and is proposed for change to classifications as shown on the *Land Use Plan*, "Exhibit C". Such rezoning will be carried out prior to redevelopment of affected portions of the site in accordance with legally established procedures of the City of Tucson.

B. Street Changes

The Prudence and Broadway intersection will be improved and Prudence Road will be widened south of the Prudence/Broadway intersection as approved by the City of Tucson Department of Transportation. The redeveloper may be required to modify and improve Prudence Road north of Broadway. Additional right-of-way for a right-turn lane on Prudence will be dedicated by the redeveloper. An optional nonsignalized break in the Broadway median divider is under consideration to accommodate left-turn movements from Broadway. The traffic signal at Broadway and Prudence will be upgraded. A bus pullout will be provided along the Broadway frontage, if required. All internal streets in the redevelopment project shall be private streets, subject to dedication of public access and utility easements thereon.

C. Building Codes and Ordinances

The project will not result directly in the modification or change of any existing building codes or other ordinances, except portions of the zoning map of the City of Tucson, and possible further refinement to policies and regulations pertaining to mitigation of hazards attributable to SWDS conditions.

VIII

KIND AND NUMBER OF SITE IMPROVEMENTS AND ADDITIONAL PUBLIC UTILITIES REQUIRED TO SUPPORT NEW LAND USES AFTER EDEVELOPMENT

A. Basic Site Improvements

Site improvements undertaken as project activities at project expense and which are consistent with methane control measures pursuant to the following subsection B-shall include: Pantano Wash west bank protection for a distance of approximately 1,900 feet south of Broadway; removal/demolition of the golf driving range; fill and re-grading of the site to promote positive drainage; upgrading of the traffic signal at Broadway and Prudence; installation of utilities at the perimeter of the site; widening of Prudence Road as required by the City of Tucson arterial and/or collector street widening policies construction of on-site circulation and access roadways as private streets in common areas; installation of perimeter landscaping in common areas; construction of storm drains and street lights; and, installation of lateral utility service structures to serve individual buildings.

Upon determination by the City of Tucson of the exact nature of improvements required for drainage and for the widening of Prudence Road, the redeveloper(s) of Broadway Proper will be financially responsible for sidewalk, curb and paving on the east side of the street per City policy. If an improvement district is established for Prudence Road, then the redeveloper also agrees to pay an equivalent of one curb and one-half sidewalk on the west side of Prudence Road from Calle Kenyon north to the southeast corner of

the State Farm Insurance property south of Broadway. In addition, offsite drainage improvements may be required.

Adequate gas, electrical, sewer, water and telephone services for the proposed development are available at project boundaries. To the extent that it is necessary and incidental to site improvement and project construction, some of these utilities may be relocated, realigned or replaced at no cost to the City of Tucson.

Depending upon future land use decisions, more intensive office/local business development of areas "D", "E" and "F" may justify construction of parking garages or single level parking decks which may be funded through the project's industrial development revenue bonding program or other sources.

B. Blight Mitigation Plan

Due to conditions of the SWDS, which encompasses a major portion of the project site (see Exhibit "B"), certain additional site improvements must be undertaken in order to mitigate existing or potential hazards to public health and safety. These are separately identified - or repeated from subsection A above - in order to comprehensively define a first phase program of actions necessary to prepare the site for redevelopment prior to occupancy of any structure thereon. Exhibit "F", the Blight Mitigation Diagram, is a graphic schematic portrayal of many of the actions listed below:

1) Clear and grub the site.
2) Surcharge with earth for compaction in selected areas.
3) Remove solid waste materials and replace with engineered fill in selected areas.
4) Place earth fill materials on the site, compact and regrade to attain positive drainage.
5) Install drainage pipes and grates.
6) Install methane gas migration control and extraction system.
7) Construct bank protection on west bank of Pantano Wash.
8) Install site surface sealants or sub-foundation vents in first phase building construction area(s).
9) Operate and maintain gas control system and surface drainage areas.

In addition to the above, development plans for each site in Broadway Proper must meet City requirements for methane control before building permits will be issued. The developer shall demonstrate that the intended land use will not increase the potential for gas migration beyond the property lines or have a detrimental impact on existing gas control systems.

IX

PROPOSED METHOD AND ESTIMATED COST OF LAND ACQUISITION AND SITEPREPARATION, AND ESTIMATED PROCEEDS OR REVENUES FROM DISPOSAL OF LAND TO REDEVELOPERS

No land is proposed to be publicly acquired. All private land is owned by the owner participant(s), who will dedicate required additional right-of-way. Prudence Road right-of-way is owned by the City of Tucson.

The Illustrative Budget, attached hereto as "Exhibit G" identifies estimated costs to prepare the site for development and estimated construction and landscaping costs to complete development. Extra budgeted costs for site preparation and building/landscaping construction, attributable to dealing with specific problems associated with the SWDS, are identified in "Exhibit H".

Direct costs of site preparation total an estimated $5,800,000, subject to final engineer's design and construction bid. Landscaping costs are estimated to be $2,000,000.

The extra costs, including design, attributable to dealing specifically with the condition of the SWDS on portions of the site are $4,640,000 of which $1,260,000 are initial building construction costs (part of Illustrative Budget). Extraordinary maintenance and operational costs over a 20-year period, which represents one-half to one-third of the economic life of the project, are estimated at $3,380,000. These costs are not included as part of the Illustrative Budget because of unpredictability; however, they must be separately identified since from time to time circumstances will arise requiring extraordinary corrective measures as a result of the inherent instability of the

SWDS. All site preparation will be done by the owner participant(s) or by the City of Tucson through an improvement district for floodway channelization.

Any land needed for public use will be dedicated to the public. No land to be developed will be publicly owned at any time; therefore, no publicly owned land is to be sold for development purposes.

X

PROPOSED METHOD OF FINANCING THE REDEVELOPMENT PROJECT

The project will be funded by Pima County Industrial Authority revenue bonds channeled through approved lending and mortgage institutions. Mortgage repayment will be from revenues from sale of project land and/or improvements and from lease proceeds. The bank protection and possibly Prudence Road improvements will be designed and installed through an improvement district or, if such a district should fail, then the redeveloper shall be responsible for completing these improvements per City of Tucson Department of Transportation policies

and standards. No financial resources of the City of Tucson will be expended except those customarily applicable to street or drainage improvement districts.

XI

FEASIBLE METHODS PROPOSED FOR THE RELOCATION OF FAMILIES TO BE DISPLACED FROM THE REDEVELOPMENT AREA

There are no resident families to be displaced from the redevelopment project area as a result of redevelopment activities.

XII

REDEVELOPER'S OBLIGATIONS AND DESIGN OBJECTIVES

A. Time for Completion

The redeveloper(s) shall begin and complete the *Blight Mitigation Plan* actions as set forth in Section VII.B above in an expeditious manner following approval of a development plan for first phase development, said completion to occur within one year of such development plan approval. In the event of increased levels of methane gas migration or other circumstances deemed to constitute a serious public health and safety hazard, the redeveloper(s) or his assigns shall implement a temporary contingency mitigation plan as soon as practicable upon receipt of notice from the Arizona State Department of Health Services or the City of Tucson.

Thereafter, the redeveloper(s) shall not be limited in time of completion of construction of other site improvements, buildings, landscaping or lighting, but shall have a continuing obligation to operate and maintain in a safe and effective condition the surface areas of the site, including any passive or active methane gas control and/or extraction systems.

B. Blight Mitigation and Maintenance

The redeveloper(s) shall comply with the provisions of the *Master Methane Control Plan*, "Exhibit I," attached hereto and made part hereof. Covenants pertaining to maintenance and operation of the methane gas control system and site drainage shall be in effect for so long as any portion of the site is occupied.

C. Design Objectives

The redeveloper(s) will be required to meet certain design objectives enumerated below, subject to development plan review and approval, in order that sound and attractive development be achieved and to ensure that the new development is properly integrated into the area:

1. Provide building orientation and siting and an arrangement and relationship among uses and structures in an interesting sequence that defines, complements and supports a strong pedestrian corridor and landscaping theme as an integral part of the overall design and project activity concept.

2. Provide an attractive urban environment utilizing design techniques and materials that blend harmoniously with adjoining areas.

3. Provide for well-designed open spaces in relation to new buildings, including appropriately screened and landscaped pedestrian and parking areas.

4. Provide maximum separation and protection of pedestrian access routes from vehicular traffic arteries and optimum internal pedestrian circulation routes within the development.

5. Reflect standards of quality and excellence required for acceptance of the concept through development plan review procedures.

6. It is expressly understood that a development plan for each proposed development, including landscaping, signing and lighting plans, must be approved by the City of Tucson prior to the issuance of a building permit. Any proposed subsequent additions, deletions or other modifications to approved plans must be resubmitted by the redeveloper(s) for approval by the City of Tucson before actual construction can occur. The regulations and controls of this *Plan* as they pertain to land use will be implemented where applicable by appropriate covenants. The covenants shall be recorded with the plat and shall run with the land for a period of 50 years with automatic 10-year extensions.

D. Sale, Lease or Reconveyance

The redeveloper(s) of project land, as owner participants, may sell, lease or otherwise transfer such land at any time prior to the completion of the redevelopment. All obligations of the owner participants arising or to arise by reason of this *Redevelopment Plan* and covenants made pursuant hereto shall be made binding upon and expressly transferred to any successors in interest.

E. Liability

The redeveloper shall be responsible for its actions on the redevelopment project site in furtherance of this *Plan*. Consistent with this general undertaking, the redeveloper shall prepare, in a form acceptable to the City Attorney, appropriate instruments holding the City harmless from liability arising from such acts of the redeveloper, its agents and employees.

XIII

PROCESSING

A. Application(s) for rezoning of development areas within Broadway Proper may be processed through public hearing and adoption of ordinances following adoption of this *Redevelopment Plan*. The adoption of the zoning ordinance shall be final, and subject to all conditions of this *Redevelopment Plan* and "conditions of rezoning" adopted by the Mayor and Council. This *Redevelopment Plan* establishes the following conditions, which are in addition to those established in the rezoning, to the issuance and finalization of building permits.

B. Prior to the issuance of a permit for construction of any building in any development area, the redeveloper(s) must have satisfied the appropriate conditions of the rezoning and shall have submitted, and the City of Tucson shall have approved, the following:

1. Legal descriptions of the development area.

2. A subdivision block plat.

3. Covenants, Conditions and Restrictions (CC&R's) in suitable form for recordation, establishing a property owners' association or other acceptable legal entity with the responsibility and financial means to undertake and carry out an ongoing and continuous program of maintenance and operation of the methane gas control system(s), private streets, private utilities and common landscaped areas.

4. Certified *Master Methane Control Plan* reviewed and approved by Arizona Department of Health Services.

5. A development plan for the development area, including drainage report.

6. Deeds or subdivision plat for all rights-of-way to be dedicated to the City of Tucson in acceptable form for recordation.

7. Legal descriptions of all utility and sewer easements and leased or sold lots in acceptable form for recordation, if required.

8. Assurances acceptable to the City, including a third party trust or trusts, that offsite and onsite improvements will be installed in a timely manner as phased development progress.

C. The timing of submittal by the redeveloper(s), for review/approval by the City of Tucson, of plans for site and utility improvements and methane gas control shall be at the discretion of the redeveloper(s), provided such methane gas control measures are fully

implemented as to the perimeter and surface areas of the site within one year of approval of a development plan on any portion of the site.

D. Prior to issuance of a certificate of occupancy for any building constructed in any development area, the redeveloper(s) shall have completed the following:

1. Installation of site and utility improvements deemed the City of Tucson to be required to serve the development, including methane gas control and mitigation system(s) certified by a registered professional engineer.

2. Recordation of all CC&R's including legal descriptions of all areas to be held in common and maintained or operated as common areas.

3. Recordation of all deeds for rights-of-way and all public access, sewer and utility easements, if required.

4. Recordation of a subdivision plat of the redevelopment area.

XIV

GRANTING OF VARIANCES IN THE EVENT OF HARDSHIPS

Where unnecessary hardships, practical difficulties or consequences inconsistent with the general purposes of this *Plan* result from the literal interpretation and enforcement of restrictions and limitations imposed by this *Plan*, the owner of the property affected may make application to the City of Tucson for a variance, stating fully the grounds of the application and facts relied upon. The City of Tucson may grant a variance under such conditions and safeguards as it may determine appropriate, consistent with the general purposes and intent of this *Plan*, provided that in no instance will any variance be granted that will change or alter the land uses or other basic requirements of this *Plan*.

XV

PROCEDURES FOR CHANGES IN APPROVED PLAN

The approved *Plan* may be modified by the City of Tucson upon compliance with requirements of the law; provided, that in respect to any land in the project area previously developed for use in accordance with the *Redevelopment Plan*, the City receives the written consent of the owner(s) of such other land in the *Redevelopment Plan* area whose interest(s) therein are materially affected by such amendment.

EXHIBIT "A"
BROADWAY PROPER METES
AND BOUNDS LEGAL DESCRIPTION
TUCSON, ARIZONA

A part of Section 17, Township 14 South, Range 15 East, Gila and Salt River Base and Meridian, Pima County, Arizona, described as follows:

COMMENCING at the Northwest corner of the Northeast One-Quarter (NE 1/4) of said Section 17;

THENCE S 00º26'26" E along the West line of the said Northeast One-Quarter (NE 1/4) a distance of 75.00 feet to the POINT OF BEGINNING on the South right-of-way line of Broadway Boulevard;

THENCE N 89°35'08" E along the said South right-of-way line a distance of 917.71 feet;

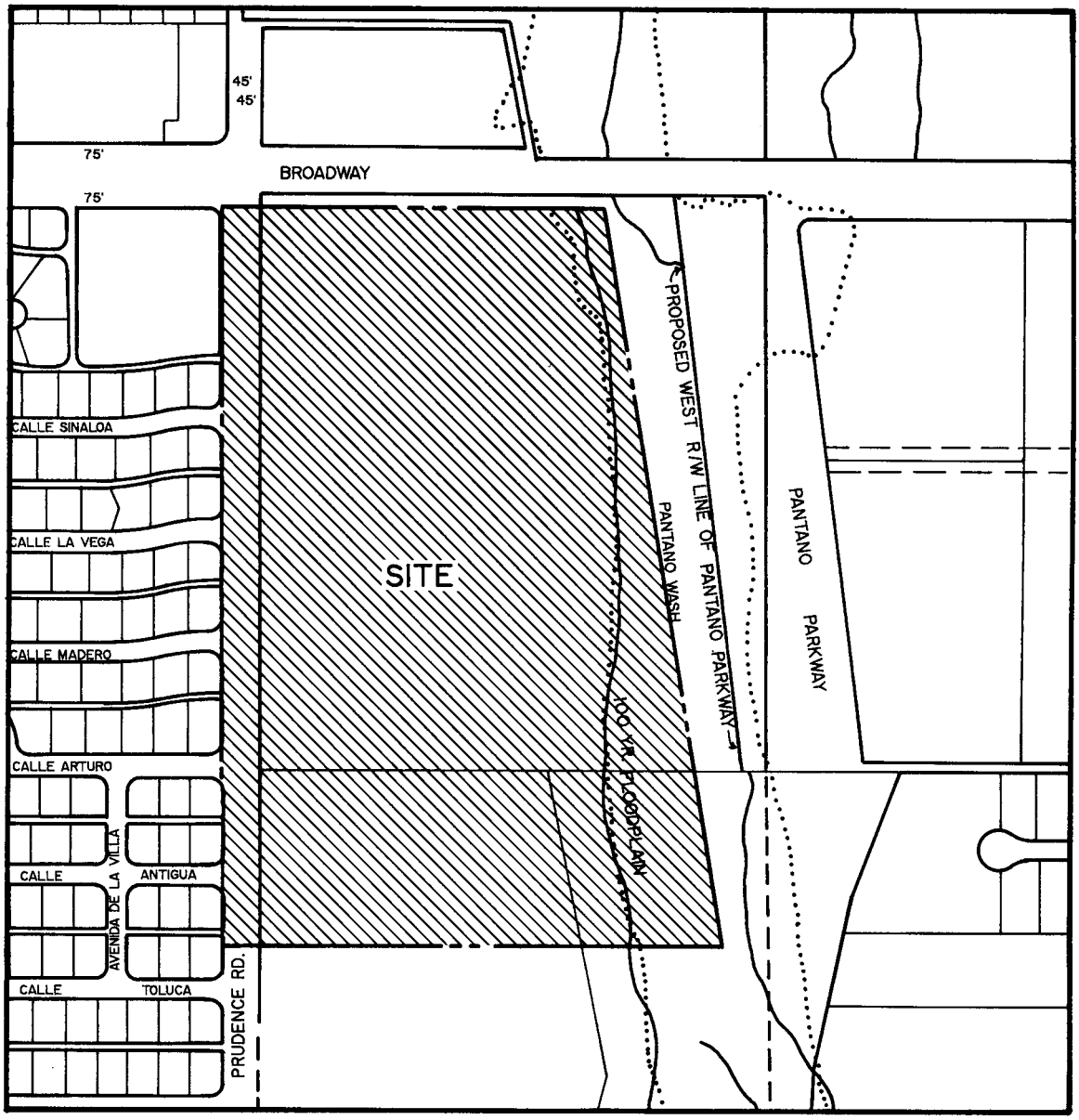
THENCE S 08°50'07" E a distance of 1,929.71 feet to a line 660.00 feet North of and parallel with the South line of the said Northeast One-Quarter (NE 1/4);

THENCE S 89°46'00" W along the said parallel line a distance of 1,244.44 feet to the West right-of-way line of Prudence Road;

THENCE N 00°26'26" W along the said West right-of-way line a distance of 1.904.97 feet to the said South right-of-way line of Broadway Boulevard;

THENCE Easterly along the said South right-of-way line a distance of 45.00 feet to the POINT OF BEGINNING.

Containing 48.3050 acres, more of less.



Broadway Proper

Location Map

Exhibit A-I

BROADWAY PROPER REDEVELOPMENT PLAN

EXHIBIT B - EXISTING LAND USE AND CONDITIONS OF REAL PROPERTY

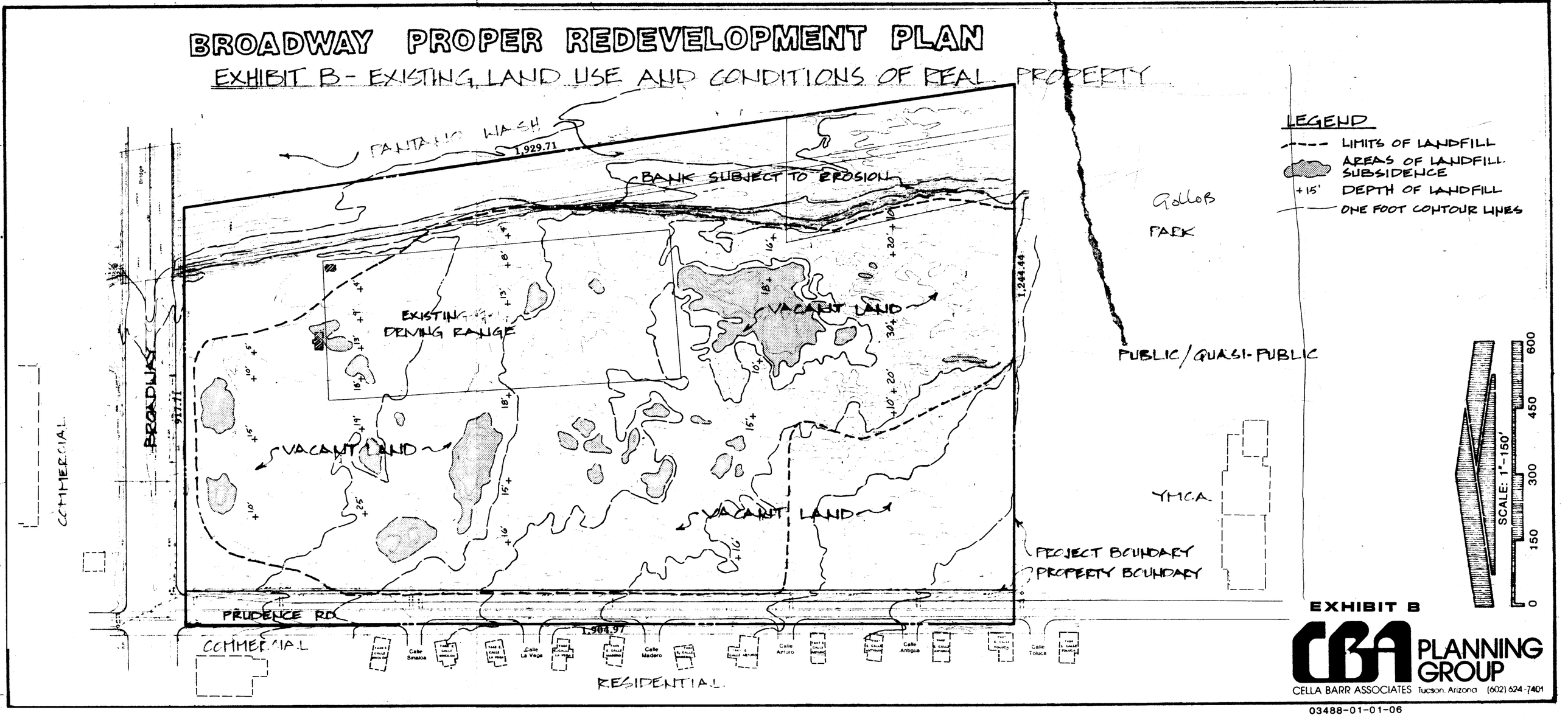
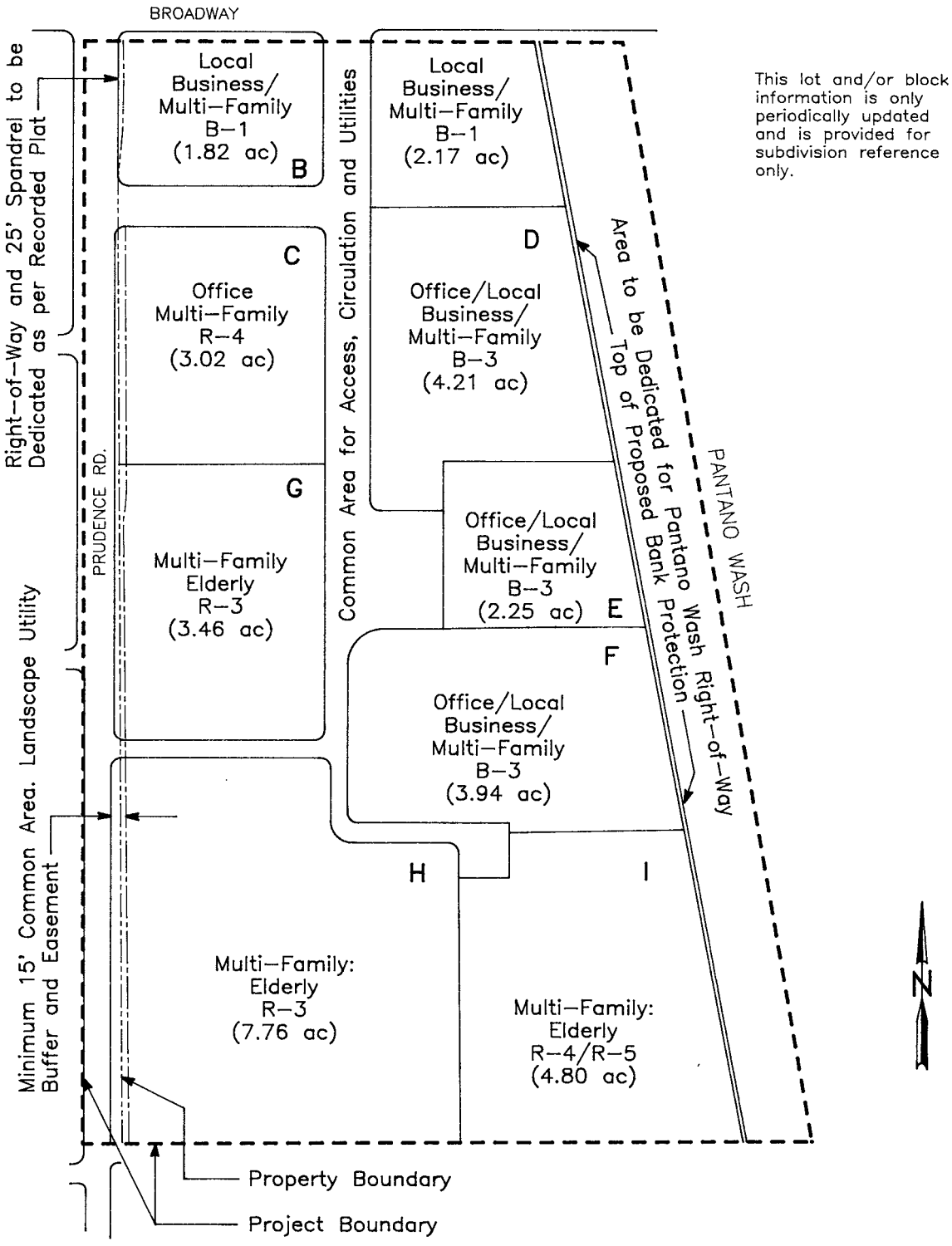


EXHIBIT B

CBA PLANNING GROUP

CELLA BARR ASSOCIATES Tucson, Arizona (602) 624-7401

03488-01-01-06

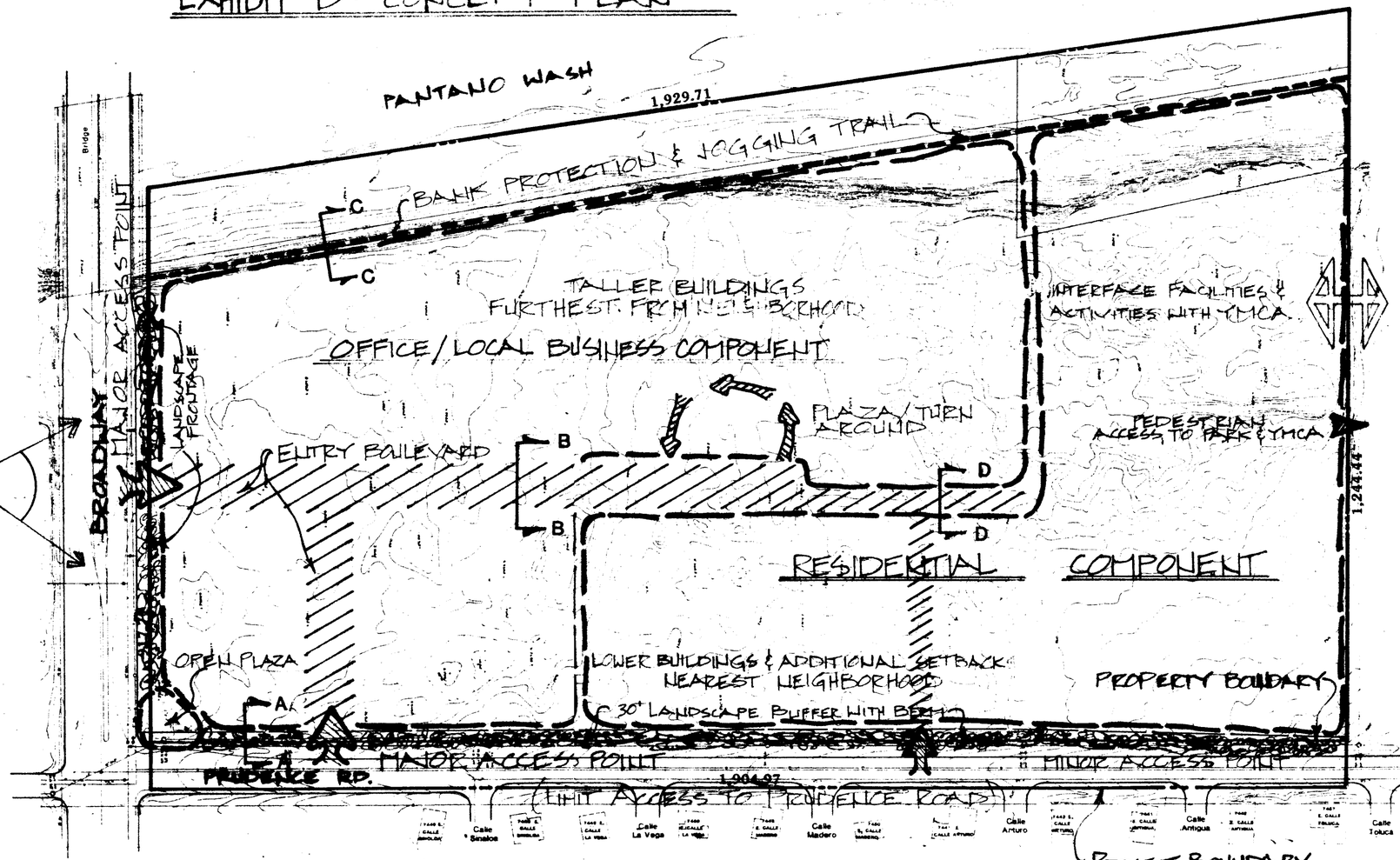


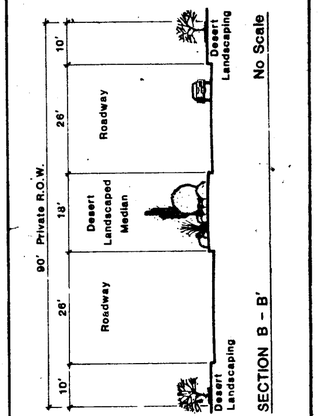
Land Use Plan

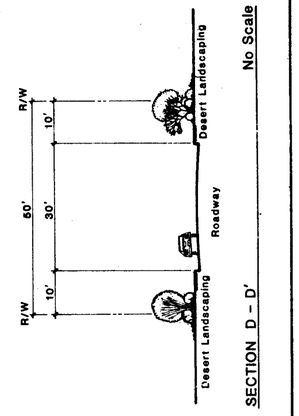
Exhibit C

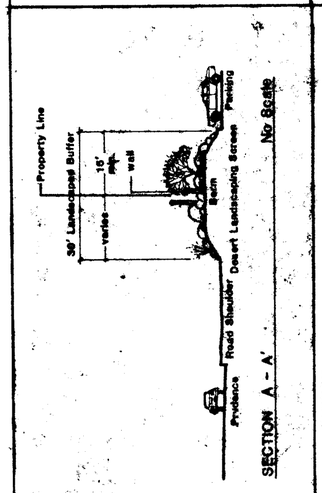
BROADWAY PROPER REDEVELOPMENT PLAN

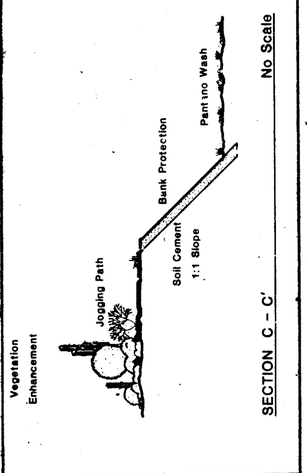
EXHIBIT D - CONCEPT PLAN











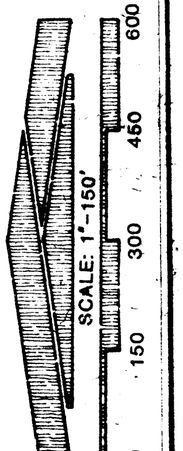


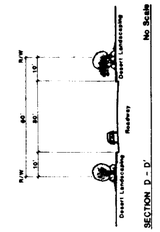
EXHIBIT D

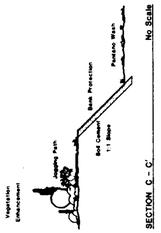
CBA PLANNING GROUP

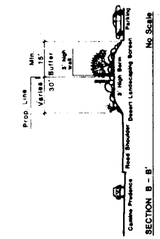
CELLA BARR ASSOCIATES Tucson, Arizona (602) 624-7401

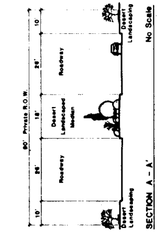
03488-01-01-06

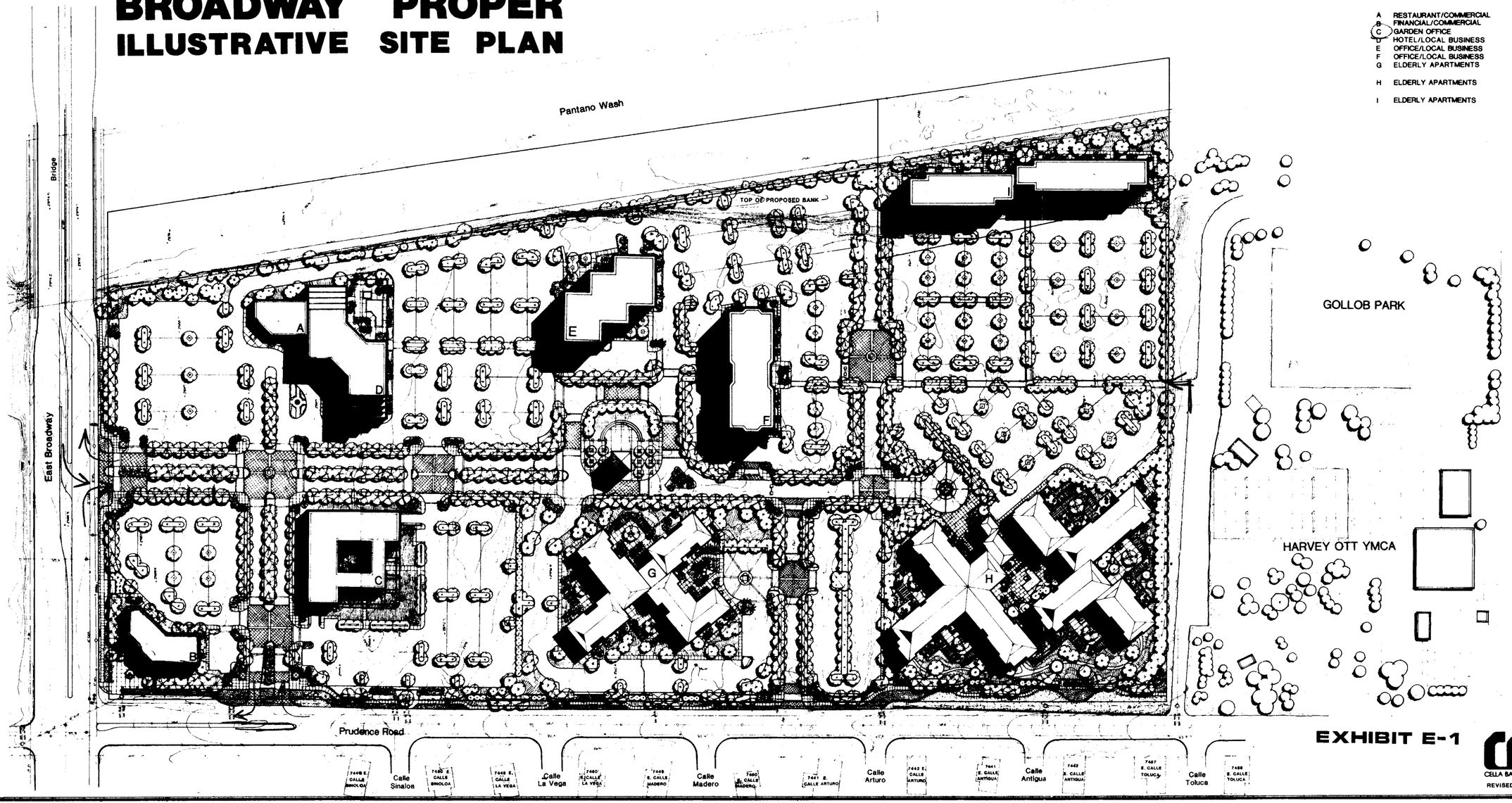
BROADWAY PROPER
ILLUSTRATIVE SITE PLAN









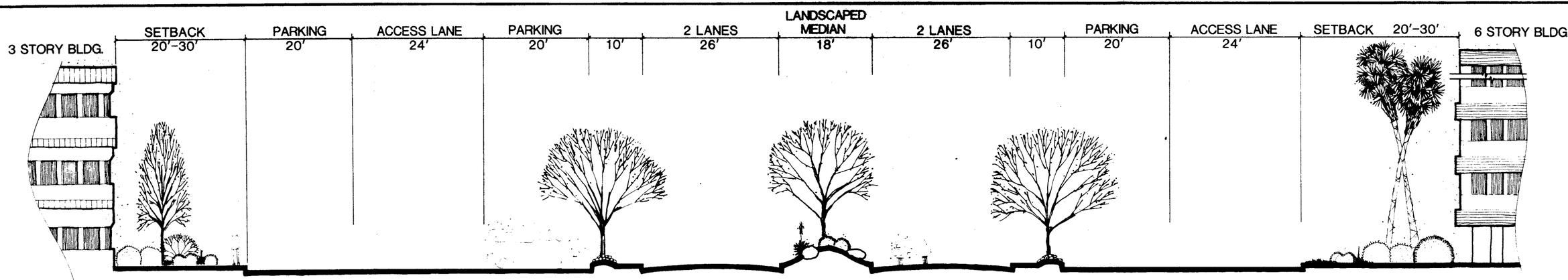


A	RESTAURANT/COMMERCIAL	1-2 STORIES
B	FINANCIAL/COMMERCIAL	2 STORIES
C	GARDEN OFFICE	3 STORIES
D	HOTEL/LOCAL BUSINESS	6 STORIES
E	OFFICE/LOCAL BUSINESS	7 STORIES
F	OFFICE/LOCAL BUSINESS	6 STORIES
G	ELDERLY APARTMENTS	3 STORIES 150 UNITS
H	ELDERLY APARTMENTS	3 STORIES 250 UNITS
I	ELDERLY APARTMENTS	7 STORIES 200 UNITS

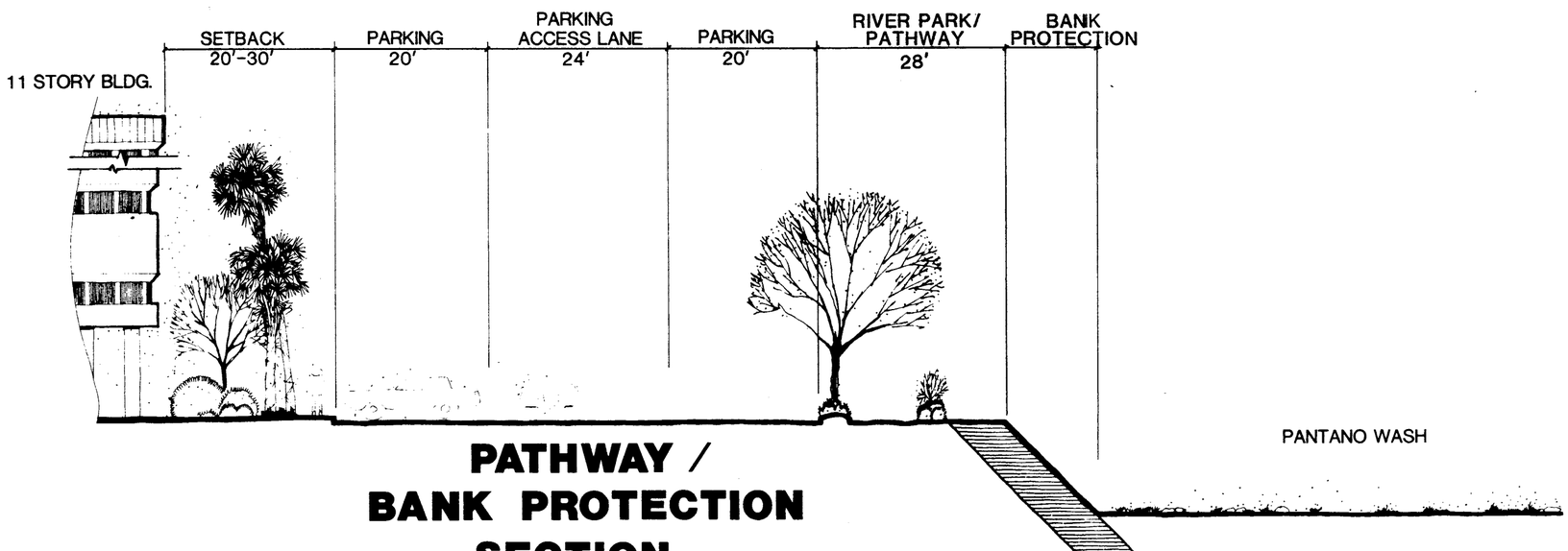
EXHIBIT E-1

CBA PLANNING GROUP
CELLA BARR ASSOCIATES Tucson, Arizona (602) 624-7401
#03488-01

REVISED 10/24/84



INTERIOR ROADWAY SECTION

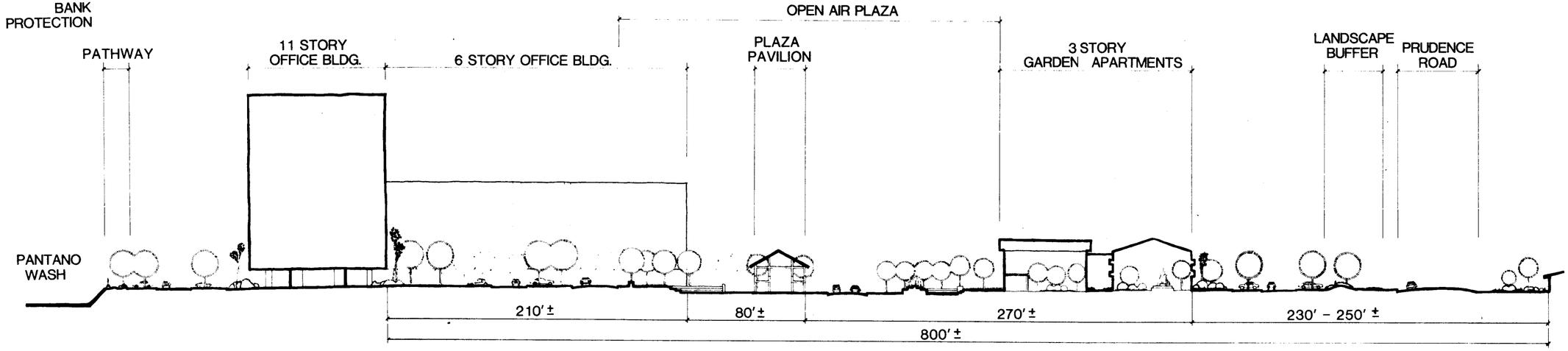


PATHWAY / BANK PROTECTION SECTION

BROADWAY PROPER

EXHIBIT E-2

#03488-01
CBA PLANNING GROUP
CELLA BARR ASSOCIATES Tucson, Arizona (602) 624-7401



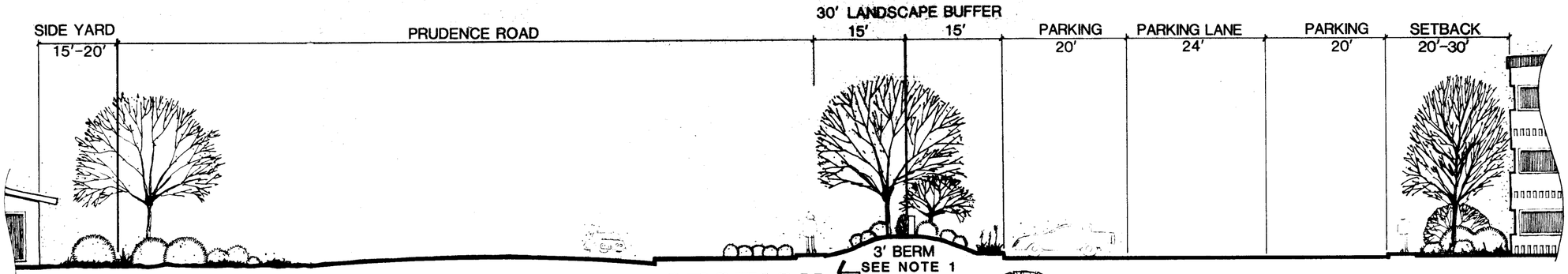
DEVELOPMENT ELEVATION EAST TO WEST

SCALE
0' 10' 20' 40' 80'

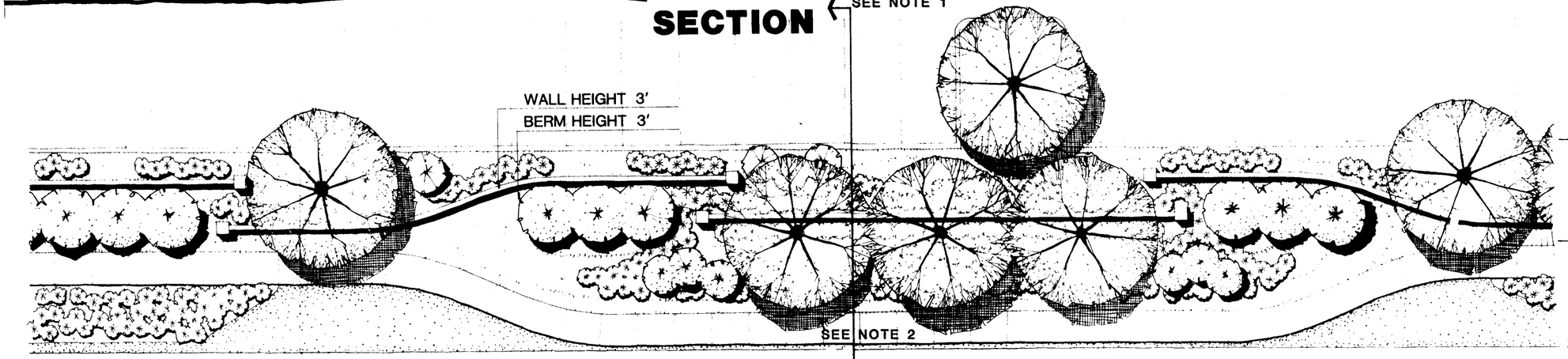
BROADWAY PROPER

EXHIBIT E-3

#03488-01
CBA PLANNING GROUP
CELLA BARR ASSOCIATES Tucson Arizona (602) 624-7401



SECTION



NOTES:

1) BERM AND LANDSCAPING HEIGHT SUBJECT TO SIGHT VISIBILITY TRIANGLE REVIEW AND APPROVAL BY THE CITY ENGINEER.

2) FINAL SIDEWALK DESIGN AND USE OF RIGHT-OF-WAY FOR LANDSCAPING SUBJECT TO APPROVAL BY THE CITY ENGINEER.

PERIMETER BUFFER PLAN VIEW

SCALE

0' 2.5' 5' 10' 20'

BROADWAY PROPER

#03488-01

CELLA BARR ASSOCIATES PLANNING GROUP Tucson, Arizona (602) 624 7401

EXHIBIT E-4

BROADWAY PROPER REDEVELOPMENT PLAN

EXHIBIT F - BLIGHT MITIGATION DIAGRAM

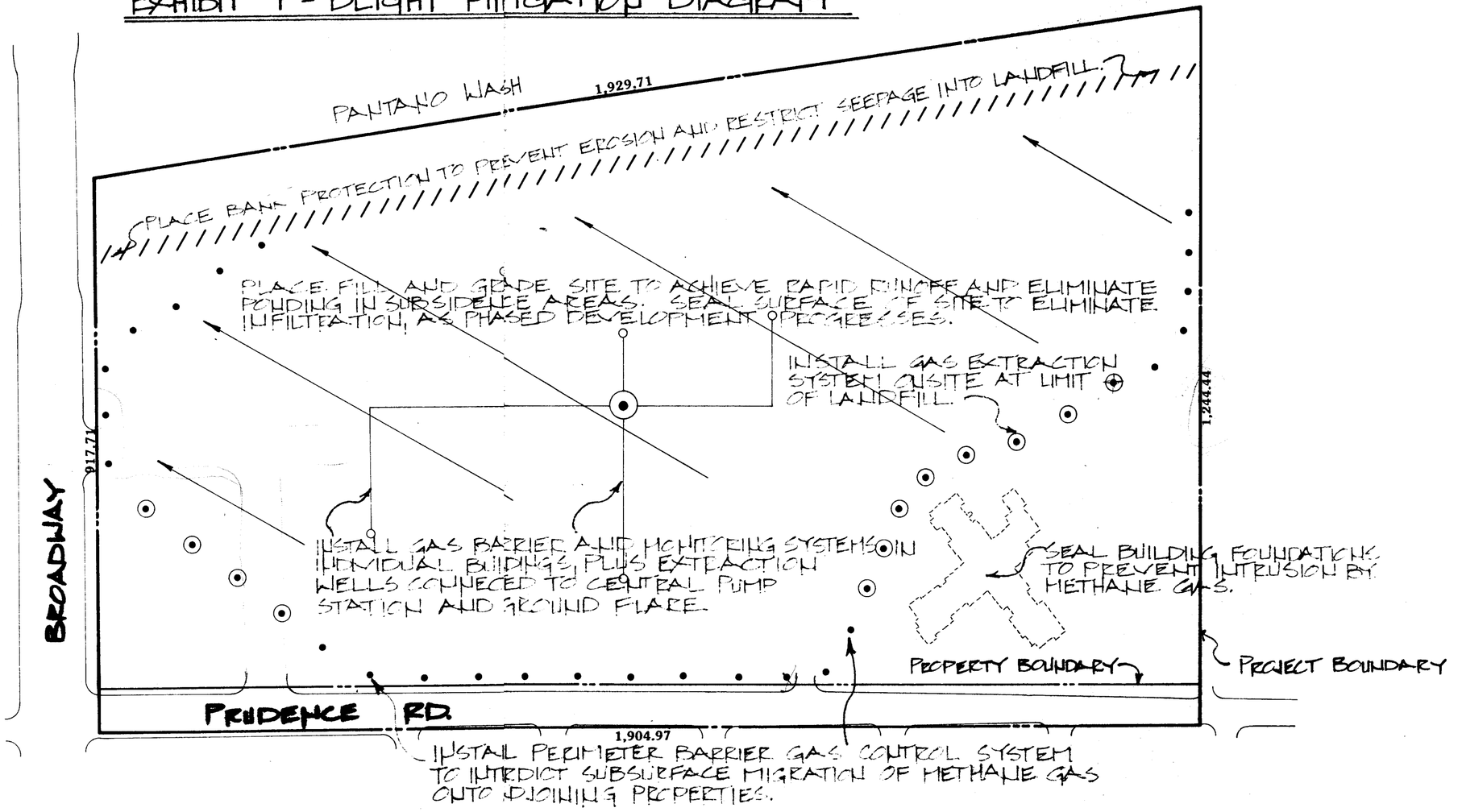


EXHIBIT F

CBA PLANNING GROUP

CELLA BARR ASSOCIATES Tucson, Arizona (602) 624-7401

03488-01-01-06

EXHIBIT G

BROADWAY PROPER REDEVELOPMENT PLAN

ILLUSTRATIVE BUDGET
($ 1984)

Commercial/Office Buildings including Land	$ 35,900,000
Multi-Family Residential Buildings including Land	21,500,000
Basic Onsite and Offsite Improvements (Civil, Electrical, Landscaping)	5,237,000
Additional Costs Attributable to Stabilization and Development of Solid Waste Disposal Site (see "Exhibit H")	3,973,000
Sub-Total	66,610,000
Contingency 10%	$ 6,661,000
TOTAL	$ 73,271,000

EXHIBIT H

BROADWAY PROPER REDEVELOPMENT PLAN
ADDITIONAL COSTS ATTRIBUTABLE TO STABILIZATION
AND DEVELOPMENT OF SOLID WASTE DISPOSAL SITE

	TOTAL $000 1984
SITE INVESTIGATION	
Probe Installation	20,000
Monitoring	9,000
Testing - Gas	3,000
- Materials	3,000
- Leachate	10,000
Consultation	25,000
	70,000
DESIGN	
Grading/Subsidence	15,000
Gas Control System	100,000
Utilities LS	5,000
Landscaping 4,000/AC	16,000
Buildings ±$2.00/SF on ground	352,000
	488,000
SITE PREPARATION	
Imported Fill 200,000 CY @ $2.5	500,000
Bank Protection 1,950 LF @ $200.00	390,000
Storm Drains 600 LF @ $150.00	90,000
Perimeter Gas Control 6,000 LF @ $4.00	240,000
Internal Control System	325,000
	1,545,000
SITE IMPROVEMENT	
Surcharge Compaction 7AC @ 10 KCY/AC @ $2.00	140,000
Utilities Structures/Seals 740 LF @ $135.00/LF	100,000
Solid Waste Disposal 3,000 CY @ $7.00/CY	21,000
	261,000
LANDSCAPING	
Membranes/Grout 4 AC @ $2.00	350,000
	350,000

Exhibit H (Cont.)

BUILDINGS	
Foundation Piers	759,000
Foundation Methane Control	347,000
Monitors/Sensors	153,000
	1,259,000
	=======
	3,973,000
OTHER	
Financing Costs for the Above-Described Development Expenses $4.0 Million @ 12% x 5 Yrs.	3,049,000
MAINTENANCE (20 Year - 1984 $)	
Fill 2,000 CY/AC @ $3.75	174,000
Paving 25 AC @ $40,000/AC	1,000,000
Landscaping $4,000/AC	109,000
Monitoring/Inspection @ 5,000/Yr/Bldg	1,100,000
Control System O&M 50,000/Yr	1,000,000
	3,383,000
	=========
	$10,405,000

These are preliminary cost estimates prepared prior to completion of preliminary site engineering and design of buildings. No warranty is given as to the accuracy and completeness of these estimates, nor is any liability assumed therefor.

BROADWAY PROPER
MASTER METHANE CONTROL PLAN
TUCSON, ARIZONA

EXHIBIT "I"
TO
BROADWAY PROPER REDEVELOPMENT PLAN

Prepared for
DECKER LAND DEVELOPERS, INC.
TUCSON, ARIZONA
September 1984

EMCON Associates
90 Archer Street
San Jose, California 95112

Project 493-01.02

EMCON Associates has prepared this document as it relates to landfill gas generation and control concepts. Drainage, irrigation and landscaping aspects were provided by Cella Barr Associates.

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(continued)

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Figures

A. INTRODUCTION

BACKGROUND

A Master Methane Control Plan is necessary for the Broadway Proper development because of past land uses. A large portion of this site and the park to the south of this development was formerly used for extraction of aggregate, and subsequently as a refuse disposal site. The decomposition of underlying refuse creates the potential for health and safety hazards, including generation of methane gas and odors and differential settlement of the ground surface.

A series of soil borings and explorations have served to identify the approximate limits and depth of the refuse fill within the Broadway Proper boundaries. The limits and depth of refuse on the park site to the south of Broadway Proper have not been determined. A total of 27 gas monitoring probes have been Installed around the north, west, and southwest boundaries. These probes are designed to monitor for the presence of gas at shallow and deep depths.

The results of the monitoring program this summer have shown that landfill gas has migrated away from the refuse and across Prudence Road between Calle Sinaloa and Calle Madero. The native soils in this general area tend to be porous, and the potential for further gas migration is relatively high.

A contingency plan has been developed to control gas migration pending the installation of the permanent perimeter control system. Conceptually, the permanent perimeter migration control system will consist of a series of gas extraction wells placed within the refuse fill. The wells will be connected to underground pipes (headers). The gas will be extracted by applying suction pressure to the wells. The gas will be transported through the piping system to a central location where it will be combusted to prevent odors. Installation of this perimeter system is to be scheduled during an early construction phase of the development.

PLAN OBJECTIVES

The Master Methane Control Plan is designed to be a dynamic document with sufficient flexibility to permit the orderly development of the Broadway Proper community, in accordance with the Redevelopment Plan, while providing guidelines for protection of the property and the public health and safety. Elements of the Plan inform Decker Land Developers, Inc. and subsequent developers of potential problems, provide design and construction controls, establish a program of monitoring, and suggest the organization needed to coordinate. manage, and implement the Plan elements.

It is not the intent of this Plan to dictate specific solutions to the problems of methane gas generation and migration, since there are many effective control alternatives and since site conditions will vary over time. Evaluation of changing site conditions and of the effectiveness of control measures will be necessary on a continuing basis.

GAS CONTROL POLICY

The primary criterion for the evaluation of gas control features will be those. guidelines established under the Resource Conservation and Recovery Act (RCRA) of 1976 and/or such laws and codes that may be enacted by local or state agencies. RCRA criteria for classification of

solid waste disposal facilities stipulate that methane concentrations at the property boundary shall not exceed 5 percent. the lower explosive limit (LEL) for methane in air; methane concentrations inside buildings and structures, such as those proposed for the development. may not exceed 25 percent of the LEL, or 1.25 percent by volume in air.

For purposes of this Master Methane Control Plan, which also deals with control of methane gas migration beyond the site, the property boundary is construed as the external property lines of the Broadway Proper as platted.

The Redevelopment Plans requires that individual Development Site Plans address methane control for each development prior to the issuance of building permits. In addition to providing for methane control for each building, utilities and site Improvements, the developer will demonstrate that the intended land use will not increase the potential for gas migration beyond the property lines or have a detrimental impact on existing gas control systems.

A brief summary of landfill gas characteristics, as well as a description of gas production and migration, follows.

LANDFILL GAS CHARACTERISTICS

The principal components of landfill gas produced by the decomposition of refuse are methane and carbon dioxide, present in the gas in approximately equal proportions. Carbon dioxide may have a minor impact on groundwater quality and surface vegetation, but its effects on human health and safety are negligible. The greatest hazard to persons and property results from the accumulation of methane gas, which is combustible when present in air at concentrations of 5 to 16 percent by volume. Methane gas may explode if it accumulates in a confined area in the presence of an open flame or spark.

Since methane is usually present in concentrations above the combustion range in landfills, it passes through the combustion range as it migrates from the landfill and is diluted with air. Fortunately, much of this dilution takes place in the soil, and the methane is usually well below the LEL of 5 percent by the time it reaches the atmosphere. However, there are many recorded instances of fires and explosions caused by landfill-derived methane; landfill gas must therefore be considered a potential hazard when building on or near a landfill.

Methane gas is colorless, odorless, and lighter than air. Since it seeks the easiest path to vent to the atmosphere, it can easily become trapped in unventilated structures, where it is difficult to detect by human senses. These characteristics make control of methane gas generation and migration an extremely important consideration in constructing on or adjacent to a refuse landfill.

LANDFILL GAS PRODUCTION

Landfill gas is produced by bacterial decomposition of organic refuse components in an oxygen-free (anaerobic) environment. Landfill gas production can begin within weeks after refuse disposal and continue for 50 to 100 years or more. Once begun, landfill gas production continues until all organic material is decomposed.

The rate of gas production is affected by the suitability of the landfill environment to biological activity. Factors affecting biological activity include refuse composition, pH, the presence of toxic chemicals, and moisture content. In a dry climate such as Tucson's, refuse tends to be relatively dry, resulting in a slower rate of refuse decomposition. It may be expected, therefore, that gas will be produced at a relatively slow rate over a long period of time.

Water infiltrating into the landfill through rainfall or irrigation of landscaping could, however. cause the landfill gas production rate to increase. Moisture management is therefore an important element of the Master Methane Control Plan for the Broadway Proper development.

LANDFILL GAS MIGRATION

Most of the gas produced within a landfill eventually escapes to the atmosphere either directly through the landfill cover or after migrating laterally through surrounding soils. Lateral gas movement occurs primarily in response to the pressure gradient caused by the continuous production of gas in the landfill.

Any activity that makes the soil cover less permeable will increase the tendency for lateral migration through the surrounding soil. Since they interfere with normal vertical gas movement, pavement or slab foundations contribute to lateral migration, as does the irrigation required for landscaping. Irrigation can fill the voids normally present in the soil and temporarily decrease the permeability of the soil cover, as can precipitation, frost, snow, or other conditions.

Lateral migration is also influenced by the hydrogeologic environment surrounding the landfill. Landfill gas tends to migrate laterally if the surrounding soils are porous sands or gravels, or if there are cracks and fissures through which the gas can easily pass. Lateral migration is likely from a deep landfill with a thick impervious cover; it is less likely from a shallow landfill surrounded by impervious soils and covered with a thin porous soil cover.

Buried pipe can also provide a conduit for gas migration, as can the pipe bedding or backfill if it is more porous than the surrounding soil. Special care will be taken when constructing utilities and utility corridors. The selection and location of utilities, as well as procedures used in their construction, will consider the potential for differential settlement and subsequent gas migration through pipe bedding, trench

backfill, and the conduit itself. Consideration will be given to locating utilities on native or engineered soil backfill or pile-supported beams to provide a firm foundation which will minimize potential line breaks caused by settlement. Where utilities pass through gas barrier systems, the design will include provisions for special boots, sleeves, and construction techniques to preclude movement of landfill gas through the area penetrated. Utility vaults, manholes, and other underground structures will be constructed with special attention to construction joints and sealing around wiring in conduits to minimize the potential for gas movement into the structure or through the conduits. Maintenance personnel entering these structures will be trained in the use of gas detection equipment and will also be provided with positive ventilation equipment.

B. ELEMENTS OF THE MASTER METHANE CONTROL PLAN

RCRA criteria and the policies of the State of Arizona, as enforced by the Arizona Department of Health Services, require that lateral gas migration from the landfill underlying the Broadway Proper development site to adjoining properties be controlled. Two general approaches will be followed in controlling landfill gas migration at the site. The first approach will be to minimize the rate of landfill gas production through proper drainage, landscaping, irrigation control, and surface maintenance. Selective refuse removal nay also be considered. The second approach will be to direct the path of landfill gas movement, so that the gas reaches the atmosphere safely and does not threaten adjacent properties. To ensure that the minimum criterion for landfill gas migration control (5 percent methane at the property boundary) is met, a monitoring program will be established and closely coordinated with selected control measures.

METHANE GENERATION CONTROLS

Since the infiltration of water into refuse can result in an increase in the rate of landfill gas generation, controlling water infiltration will be a prime concern at the Broadway Proper development. The following procedures will be used to prevent water from entering the refuse and accelerating the rate of landfill gas production.

Drainage

It is important that proper drainage be maintained throughout the expected life of the Broadway Proper. This will require continuing efforts by the institutional entity responsible for grounds maintenance and gas migration control. since continual surface settlement is probable, due to consolidation of the underlying refuse and Its progressive decomposition. Such settlement is likely to be uneven, creating areas in which ponding and subsequent infiltration of water can occur.

Ponding of water at the Broadway Proper development will be prevented by maintaining surface slopes of sufficient grade to promote rapid drainage of rainfall or irrigation water to natural or constructed watercourses outside the landfill area, ultimately draining to the Pantano Wash. The water drained from paved and unpaved surfaces will be conducted to storm drains through surface drainage structures. All such structures in or near landfill areas at the Broadway Proper will be carefully constructed and maintained to prevent leakage of drainage water into the landfill. Construction of underground storm drains and drainage structures will be avoided where possible, since the overall gas control strategy is to prevent or minimize the potential for fire and explosion hazards due to accumulation of landfill gas in such structures.

Landscaping and Maintenance

Even with proper drainage, some water can be expected to enter the refuse. Careful landscaping and maintenance of the Broadway Proper site will, however, minimize infiltration.

As part of the Master Plan, irrigation will be limited to that required to maintain healthy foliage, and irrigation systems will be located to ensure sufficient watering of areas needing irrigation, while preventing over-irrigation of other areas.

A relatively fine-grained soil will be placed to prevent the percolation of. irrigation water and precipitation into the refuse. However, continued maintenance will be needed to eliminate cracks, holes, and other fissures through which water could enter the refuse. The need to provide a dense cover which will prevent infiltration of moisture oust be balanced against the effect such a cover will have on the lateral migration of gas.

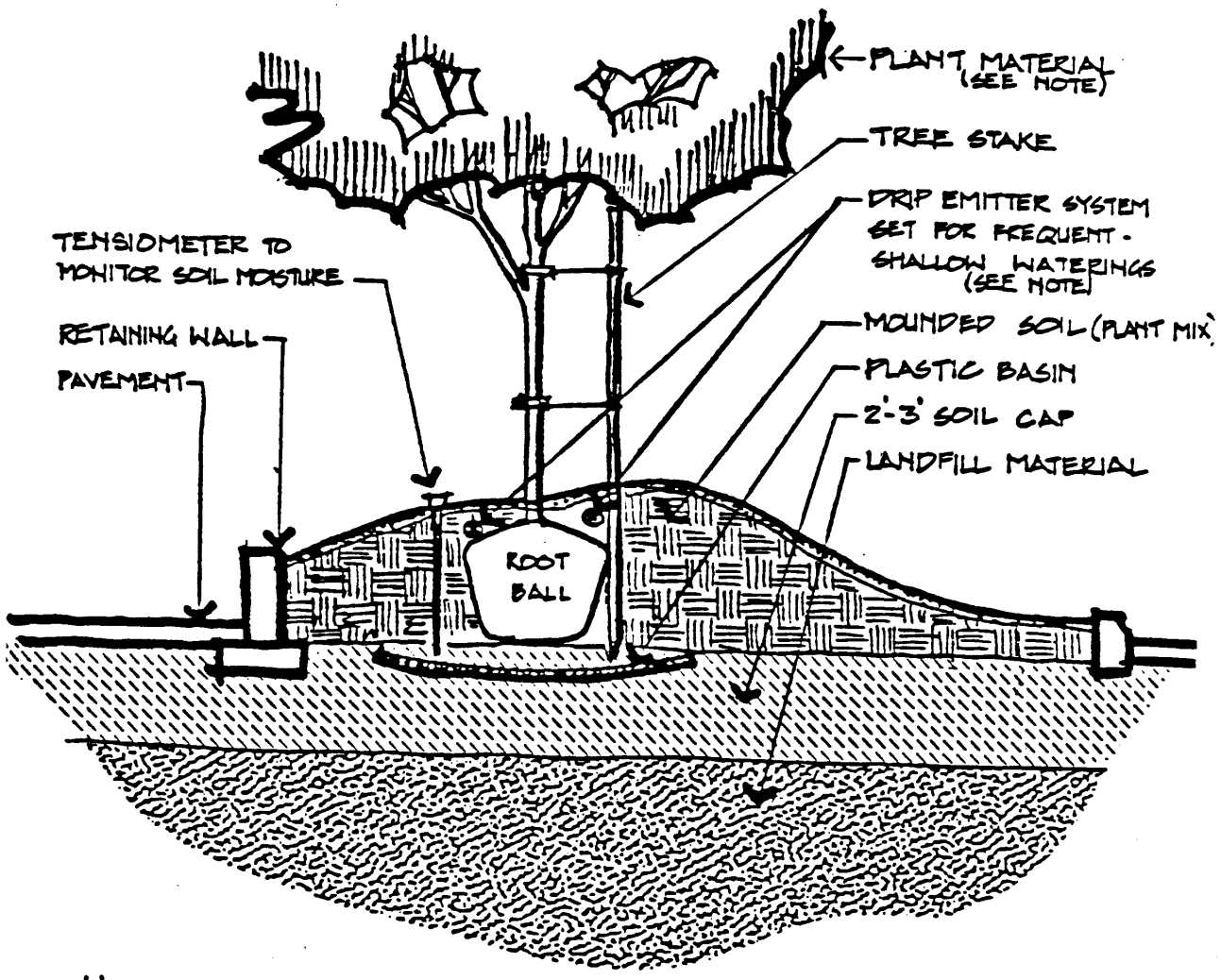
The plants chosen for the site will be those requiring little water, with root systems capable of capturing irrigation water so that It does not penetrate the soil. Plants which effectively remove moisture from the root area by evapotranspiration, thus decreasing the amount of water present in the soil cover and minimizing the potential for percolation into the landfill are preferred. Also, tensiometer measurement of soil moisture can regulate irrigation intervals in order to maintain plant health without excessive water application. Figures A to E on the following pages show alternative planting techniques.

Although minimizing the amount of water entering the refuse will prevent a rapid increase in the rate of landfill gas production, production of landfill gas cannot be entirely prevented. Measures to control the migration of landfill gas are therefore needed.

Refuse Removal

Refuse removal cannot be considered a practical solution for preventing further generation of landfill gas within specific areas of the Broadway Proper site, unless the amount of refuse to be removed is small or refuse removal can be combined with some other construction procedure or design feature in the site development. The depth of the fill to be removed, the nuisance aspects of refuse removal, and the cost of disposing of the excavated refuse are three important constraints.

Refuse removal prevents landfill gas generation in the specific area from which refuse is removed. However, landfill gas may continue to migrate towards this area from nearby refuse fill. To prevent migration of landfill gas towards an area to be protected, sufficient refuse must be removed to provide a neutral zone in which the landfill gas can vent naturally to the atmosphere. However,, the width of the venting zone needed to buffer proposed improvements from gas migration is not easily predicted and will vary as a result of factors not readily controlled.

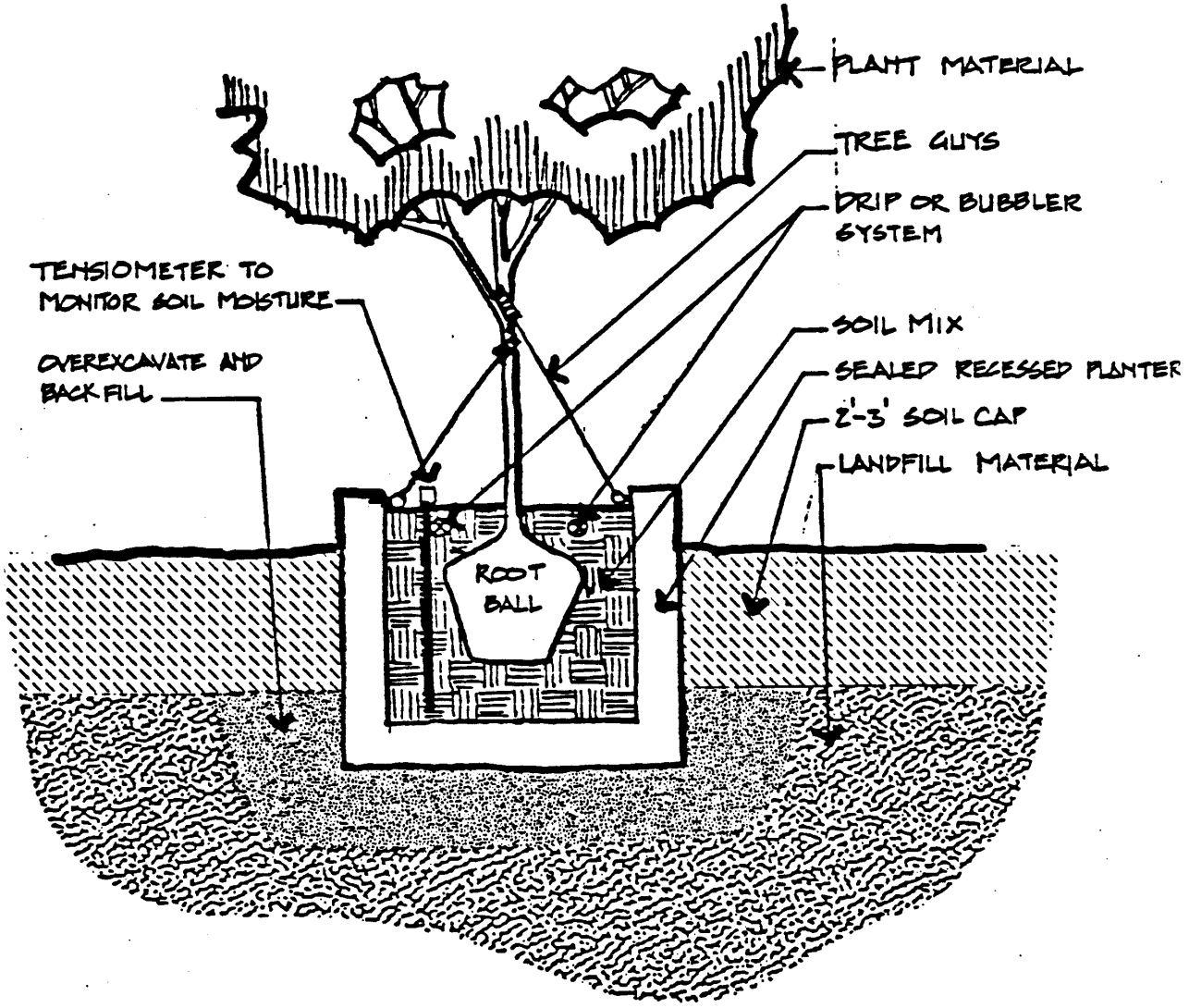


NOTES: ① PLANT MATERIAL IS TO BE SHALLOW ROOTING, DROUGHT & SALT TOLERANT

② IRRIGATION SCHEDULING IS TO BE CALCULATED BY PLANT REQUIREMENTS, ROOT DEPTH, SOIL PERCOLATION RATE, AND NATURAL PRECIPITATION. WATERINGS WILL ALLOW ROOT ZONE TO REACH APPOPRIATE MOISTURE LEVEL WITH OUT PERCOLATI INTO LAND FILL AREA.

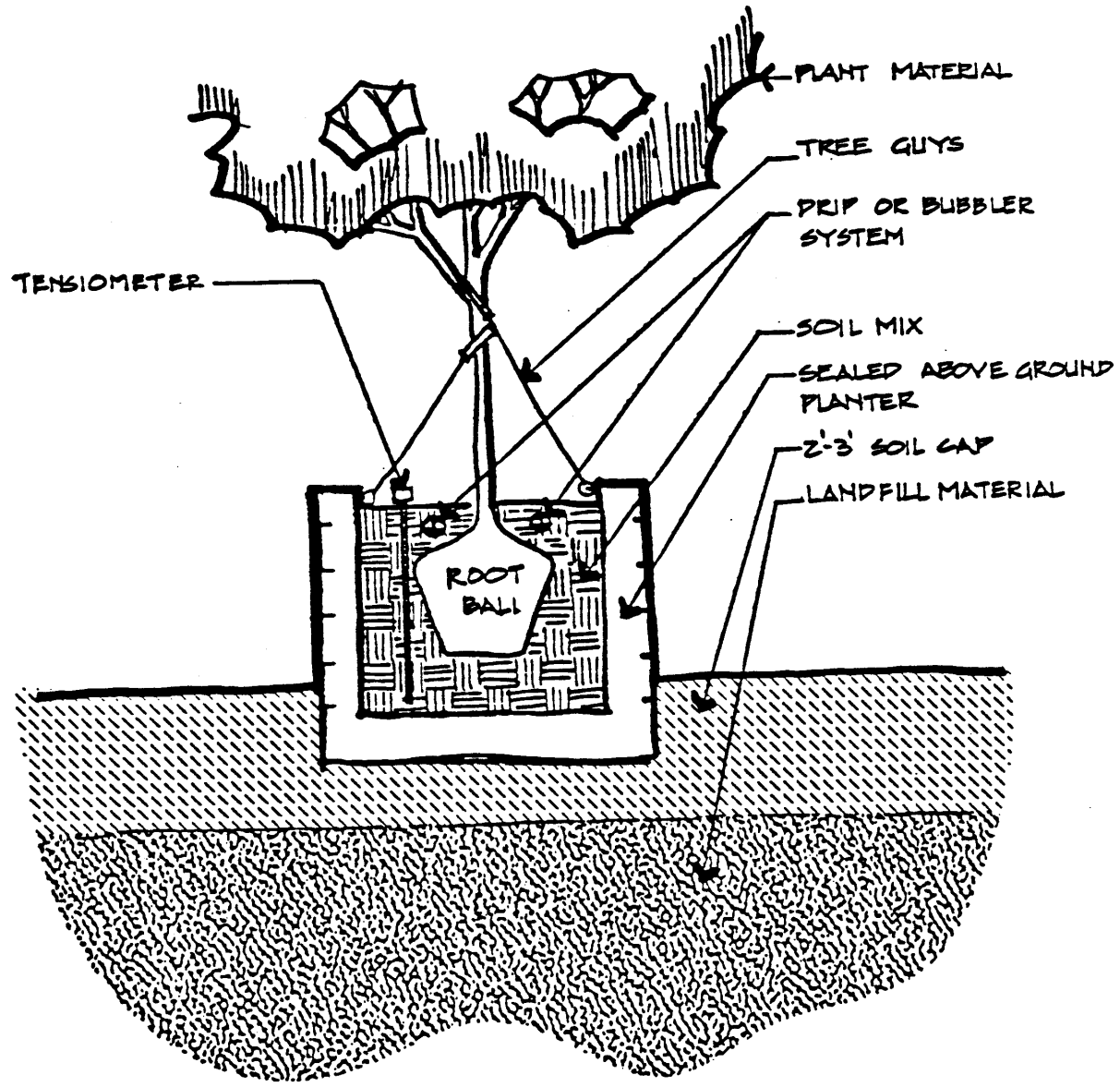
PLANTING OVER LANDFILL (PLASTIC BASIN)

FIG. A



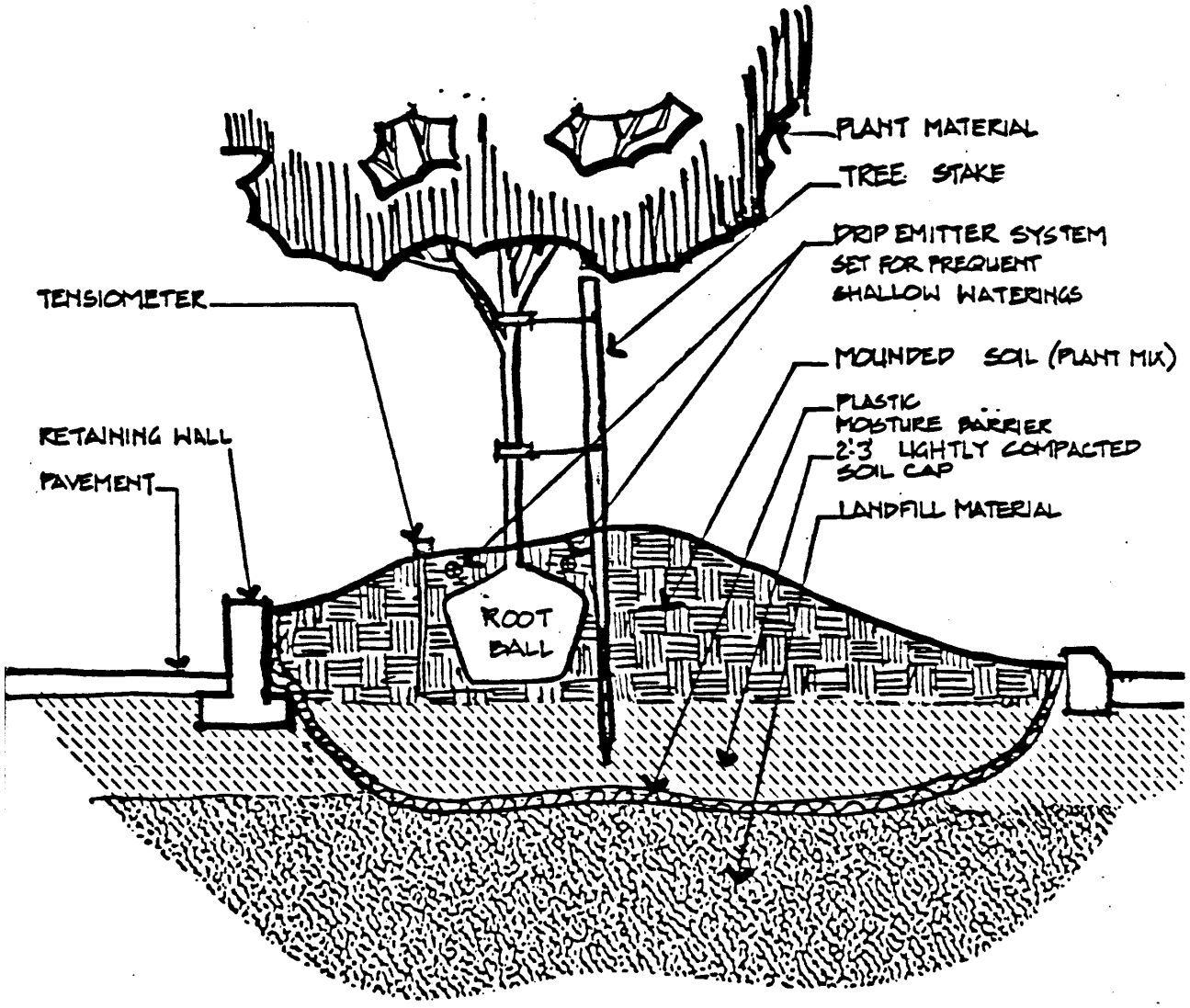
PLANTING OVER LANDFILL (RECESSED PLANTER)

FIG. B



PLANTING OVER LANDFILL (RAISED PLANTER)

FIG. C

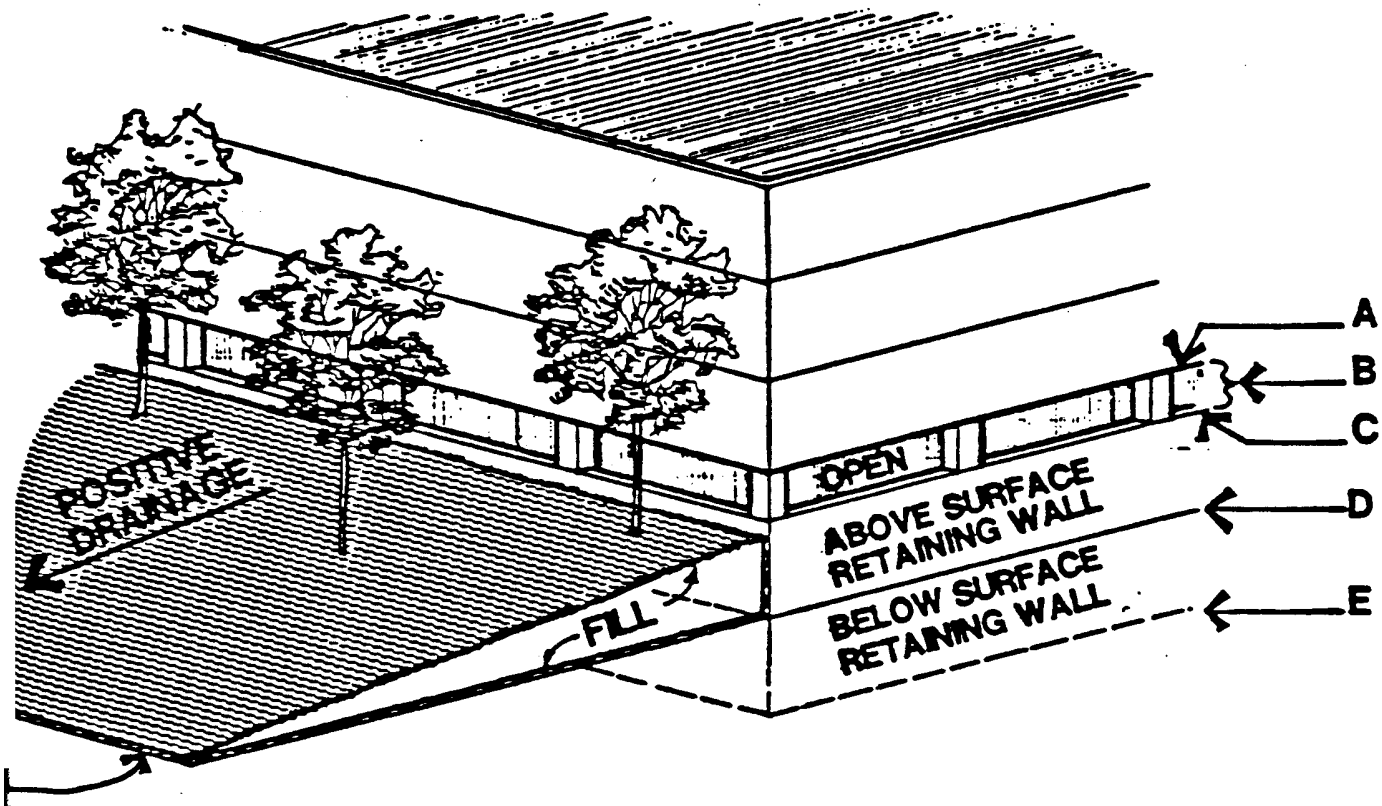


NOTES:

1. PLANT MATERIAL IS TO BE SHALLOW ROOTING, DROUGHT & SALT TOLERANT
2. IRRIGATION SCHEDULING IS TO BE CALCULATED BY PLANT REQUIREMENTS, ROOT DEPTH, SOIL PERCOLATION RATE, AND RAINFALL. WATERINGS WILL ALLOW ROOT ZONE TO REACH APPROPRIATE MOISTURE LEVEL WITHOUT PERCOLATION INTO LANDFILL AREA.
3. SOIL CAP IS TO BE LIGHTLY COMPACTED AND OF POOR SOIL QUALITY AS TO DISCOURAGE ROOT GROWTH IN THAT AREA

PLANTING OVER LANDFILL (MOISTURE BARRIER)

FIG. D



A	BOTTOM OF FIRST FLOOR
B	2' MIN. VENT OPENING
C	TOP OF RETAINING WALL
D	NATURAL GRADE
E	LIMIT OF EXCAVATION

PLANTING AROUND BUILDINGS

FIG. E

If refuse is removed, it will be disposed of in accordance with State Health Department landfill requirements.

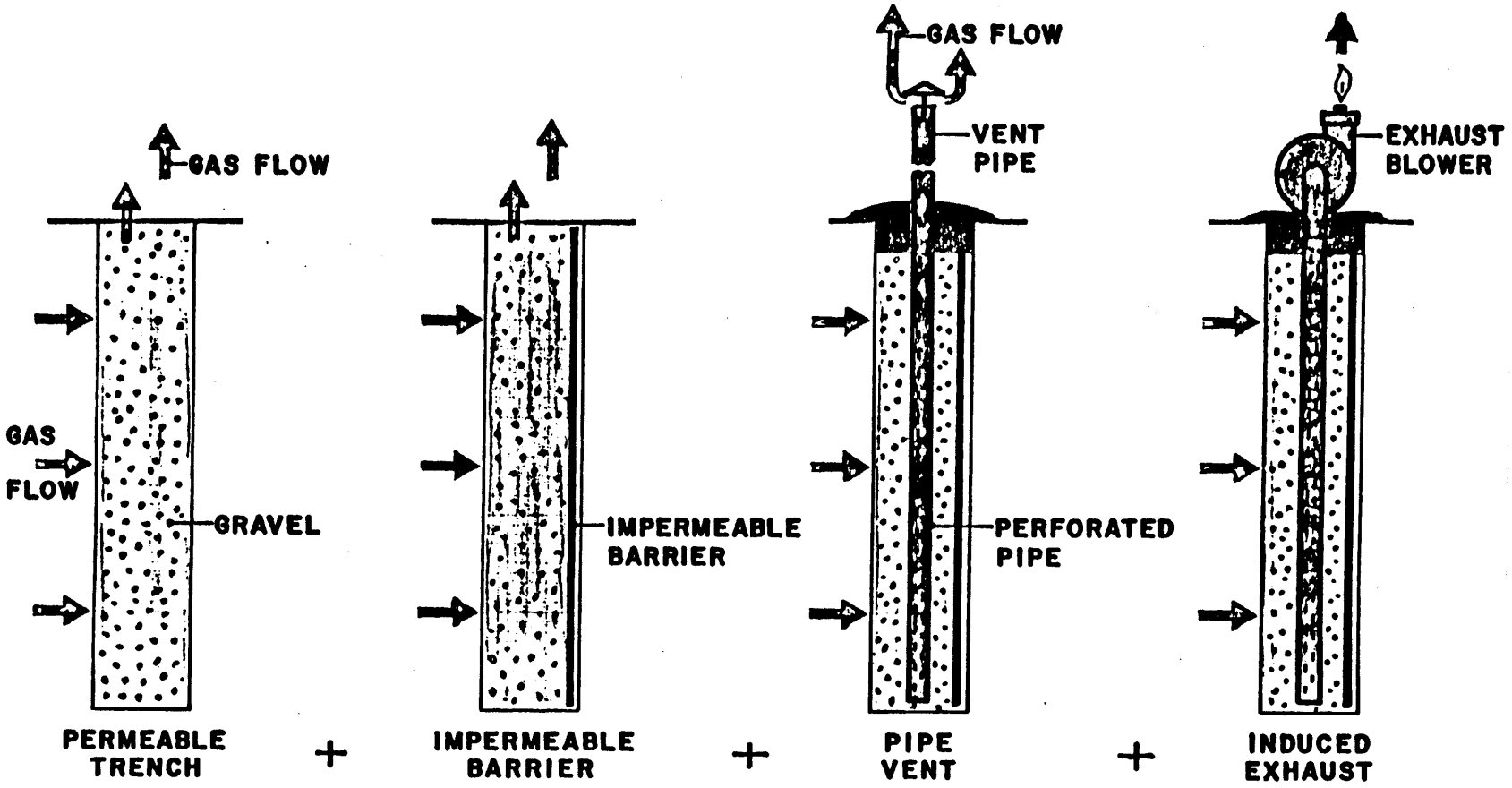
CONTROL OF LATERAL MIGRATION

Control of lateral gas migration at the Broadway Proper site has the clear objective of maintaining acceptable concentrations of methane at the property boundary, as defined by RCRA and enforced by the Arizona Department of Health Services. To ensure the compatibility of this objective with the smooth development of the site in accordance with the Specific Plan, flexibility in selection, design, and installation of control systems is required. It should be stressed that there are many possible control system configurations. No one type of system or system configuration can be recommended as the only effective control measure. Site conditions oust be continuously monitored to evaluate the effectiveness of any existing control system and to identify the need for additional or different methods of control. Migration control systems which may be effective at the Broadway Proper site include passive, active, and combination systems. Figures 1 and 2 depict several control concepts and common locations for installation. The selected system must recognize and be coordinated with any control measures developed for the adjacent park property.

Active Systems

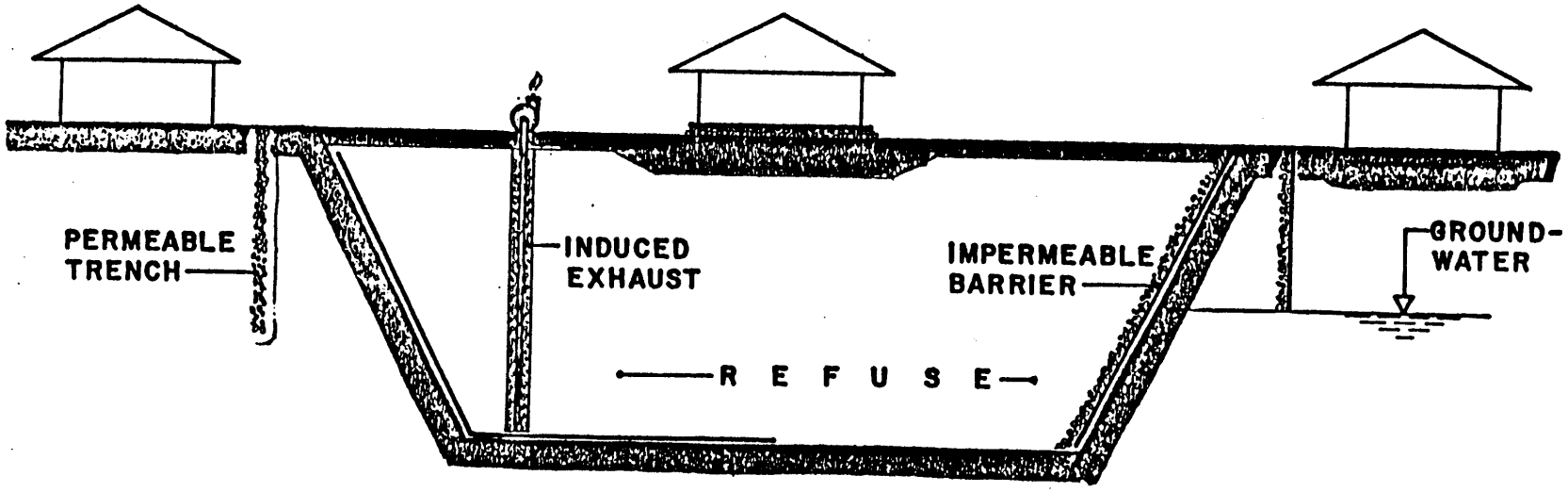
Active control systems use mechanical power to pull or push subsurface landfill gas from the area to be protected. Most active systems control migration of gas by withdrawing the gas from beneath the ground surface at nor near the edge of the refuse fill. The collected gas is then usually burned to control odors.

A typical withdrawal system consists of one or more gas collectors, usually vertical gas wells, installed 100 to 200 feet apart along the landfill edge. A suction blower, usually electrically powered, withdraws the gas from the collection wells through a plastic pipe system.



SCHEMATIC
OF
GAS CONTROL SYSTEMS

FIGURE 1



COMMON LOCATIONS
FOR
GAS CONTROL SYSTEMS

FIGURE 2

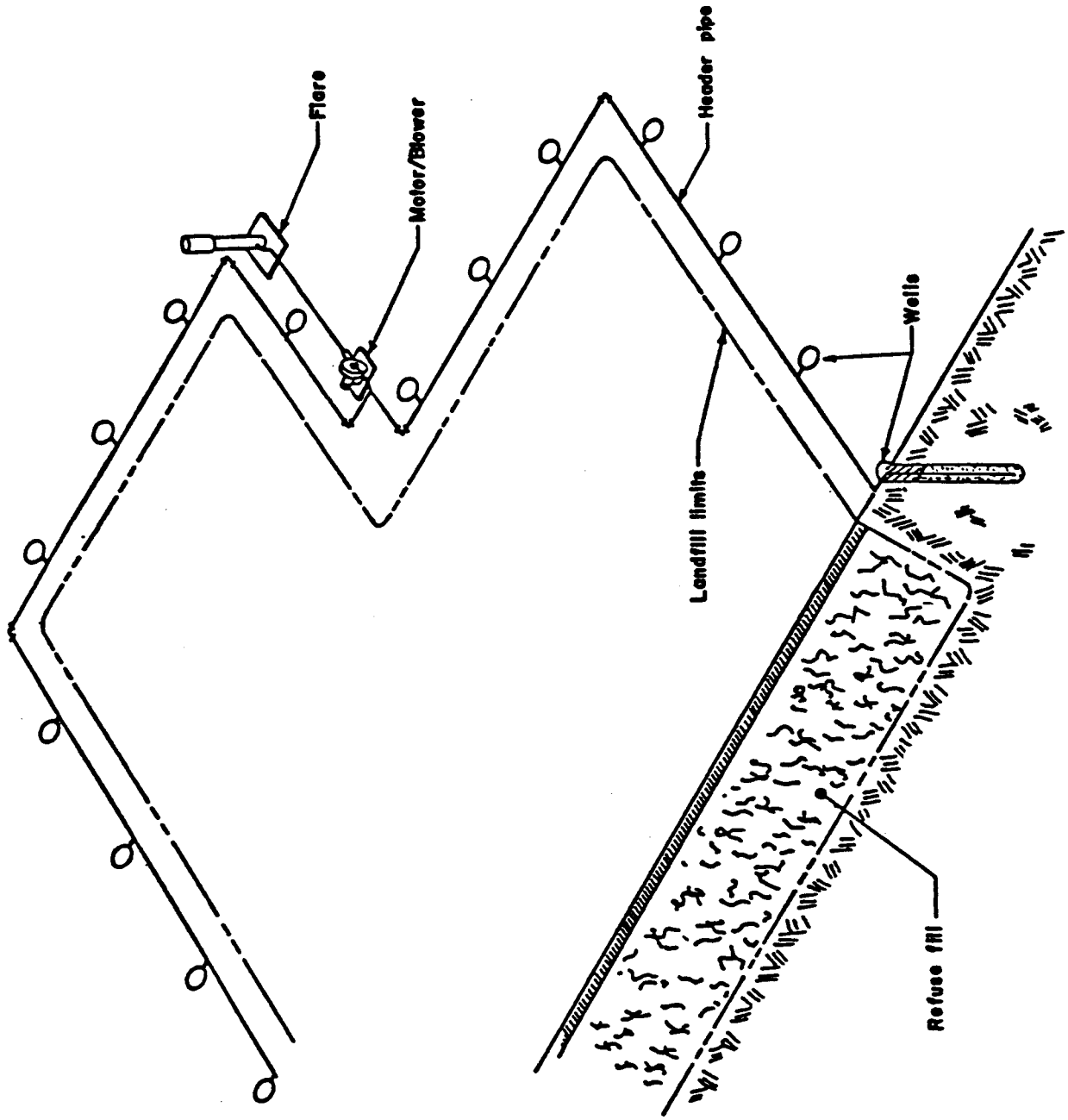
The collection wells can be installed in the landfill itself or in nearby native soil. Installation in refuse is usually preferred, since the greater permeability of refuse makes the wells more effective. Figures 3 and 4 show typical external and internal active control systems.

A less frequently used active control method is the injection of air into the soil near the landfill to create an "air curtain" serving as a barrier to subsurface migration of landfill gas. Injection of air into the refuse itself is, however, not recommended since the introduction of oxygen my lead to spontaneous combustion and fire.

A primary advantage of active system is their relatively low construction cost, due to the minimum drilling and relatively shallow trenching necessary to install an active control system. A second advantage is the system's flexibility. Flow rates and gas composition can be measured at various locations in the system, and withdrawal rates from individual wells can be adjusted to ensure optimum control of methane migration. Total system capacity can be increased at any time by increasing the capacity of the blower or by adding more wells.

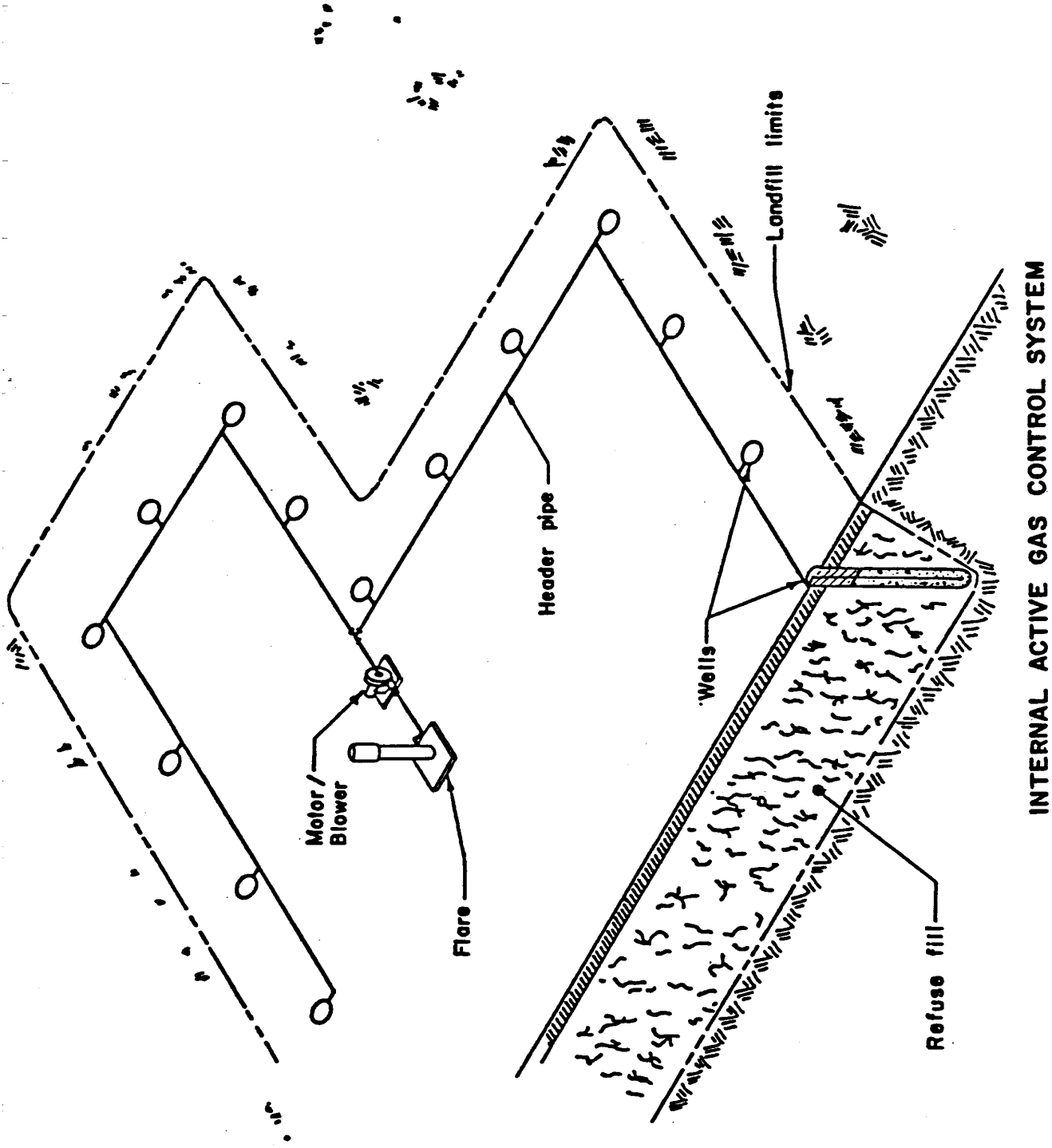
A disadvantage of active systems is the operation and maintenance cost of the mechanical components, primarily the blower. Differential settlement of the landfill can also cause damage to the transmission piping (header) and wells; however, proper system design and prompt maintenance can minimize these problems. Such systems will be considered in conjunction with site-specific development plans, particularly for large buildings.

In some cases, the gas collected by active control systems can be used as a supplementary fuel by nearby users. The feasibility of landfill gas use depends on the quantity and heat content of the collected gas and on a nearby market for the gas. Since Pony of the structures comprising the Broadway Proper will be constructed over refuse, gas could be withdrawn from the landfill to provide supplementary fuel for such uses as water heating or space heating. These potential uses, although



EXTERNAL ACTIVE GAS CONTROL SYSTEM

FIGURE 3



INTERNAL ACTIVE GAS CONTROL SYSTEM

FIGURE 4

not directly related to the control of gas migration, may warrant consideration in the development of the site, since energy saving could help offset the cost of migration control. Several system designs are available to site developers and/or building owners.

Passive Systems

Passive systems control landfill gas migration by physically blocking the migration of landfill gas (barrier trench), by providing a path of least resistance through which the landfill gas can vent safely to the atmosphere (vent trench), or by a combination of both methods (vent/barrier trench). See Figure 1 for examples of these control concepts. Such systems may be installed at or beyond the landfill boundary.

A vent trench is a passive control system consisting of a trench dug in native soil and filled with gravel or other granular material. Because gravel is more porous than the surrounding native soils, migrating gas intercepted by the trench will usually vent through the gravel to the atmosphere instead of continuing its lateral migration.

A barrier trench, dug along the perimeter of the property, uses a synthetic membrane or clay materials to block the lateral flow of gas. If clay materials are used as the barrier, the trench is excavated and backfilled with a clay/soil (or cement) slurry mixture. If an inert synthetic membrane is chosen as the barrier material, the trench is usually backfilled with porous material to promote the vertical movement of gas (vent/barrier trench).

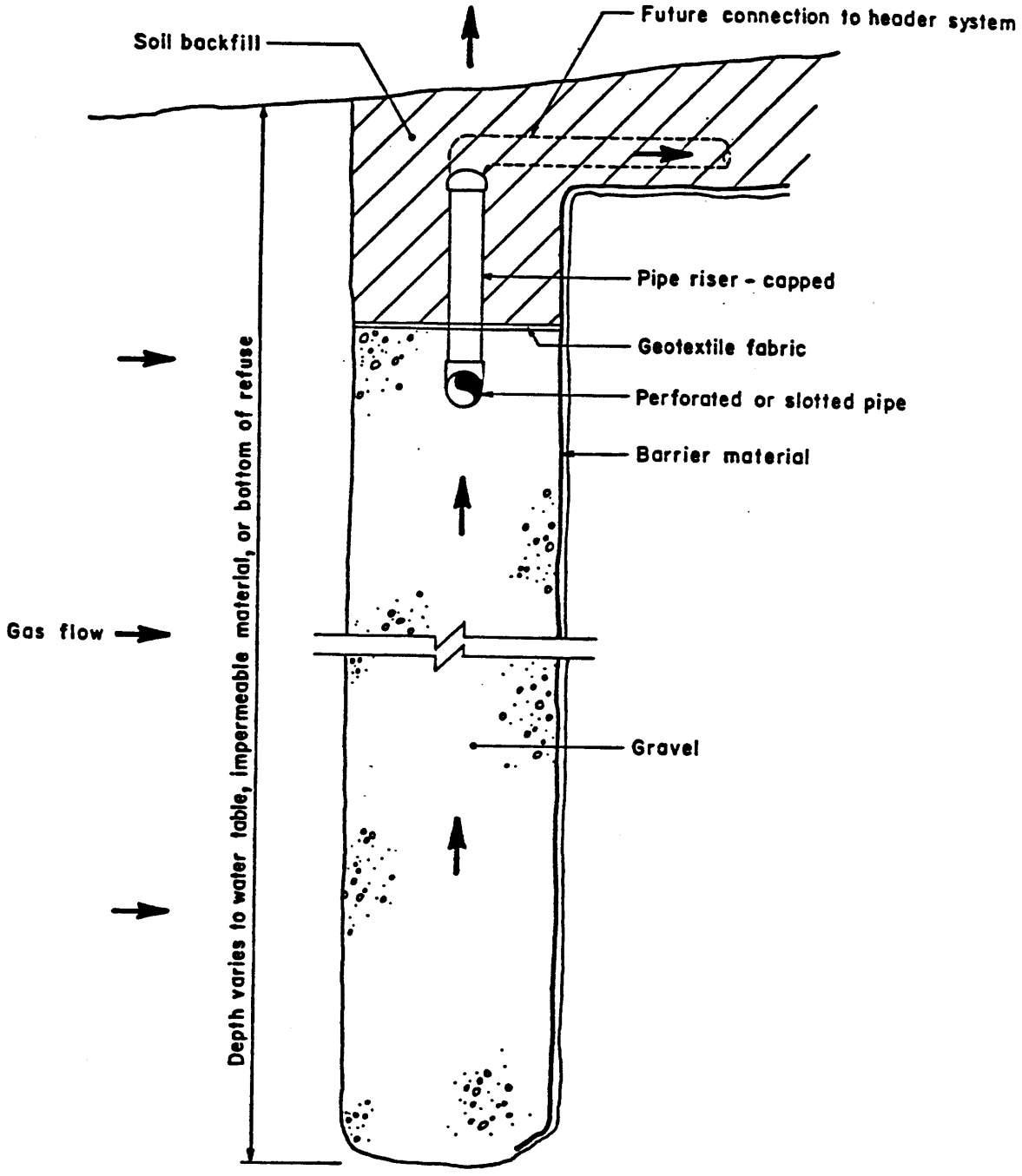
The depth of excavation for a passive system is determined by the depth of the refuse, the hydrogeology of the site, and the degree of control desired. To provide maximum control of gas migration, the trench should be excavated to an impermeable subsurface layer, such as a thick clay stratum, water table or competent bedrock. If an impermeable subsurface layer is not present, the trench should be dug as deep as the bottom of the refuse. Greater depth is desirable in areas with sand lenses or other geological strata which would permit gas to circumvent the trench.

The primary advantage of passive control of gas migration is the low operation and maintenance requirement. Because there are no mechanical components, there are no expenses for power or replacement of equipment. A disadvantage of passive control systems, however, is the fact that they are not always effective, particularly if there is no impermeable subsurface layer to become part of the barrier. A second disadvantage is the cost of installing a passive control system, which can be prohibitive due to the high cost of trenching, backfill,, and/or liner material. However, if excavation of soil or refuse near the periphery of the landfill is part of the site development plan, the cost of construction attributable to the barrier trench in that area would be reduced. Because of high installation costs, barrier trenches are usually limited to depths of 30 feet or less. A third disadvantage is the passive system's lack of flexibility. Once constructed, a passive system controls migration by natural forces, such as the high permeability of the backfill material.

Combination Systems

Recognition of the inflexibility of the passive systems has prompted the installation of combination or "hybrid" systems. Hybrid systems are vent or vent/barrier trenches which provide for active withdrawal at a later time, should monitoring results indicate active withdrawal is necessary. To provide this future active withdrawal capability, perforated plastic pipe is installed along the length of the trench within the gravel backfill. This perforated pipe is connected to the surface by vertical risers through which landfill gas can be withdrawn. A suction blower is installed only if the passive vent or vent/barrier trench does not effectively control landfill gas migration. Figure 5 shows a typical combination vent/barrier control system.

Hybrid systems have the advantage of avoiding the stringent operation and maintenance requirements of active systems, while providing active withdrawal capability when and if necessary. However, the construction cost of a hybrid system is usually greater than either a passive or



TYPICAL COMBINATION
VENT/BARRIER TRENCH

FIGURE 5

active system. For this reason, a hybrid system is usually installed where it is likely that a passive system will successfully control landfill gas migration, but where assurance of effective control of landfill gas migration is imperative.

Based on the current development plans, passive control measures do not appear to be practical for any perimeter control systems at Broadway Proper. Passive system designs-will be most likely used at individual structures - such passive systems should be provided with components to permit easy conversion to an active system if unforeseen increases in landfill gas generation occurs.

MONITORING OF SYSTEM EFFECTIVENESS

An integral part of the Master Methane Control Plan for the Broadway Proper development is a program to identify changing site conditions and to verify the effectiveness of the selected control systems in mitigating landfill gas migration across site boundaries. It is essential that the monitoring program be closely coordinated with system operation.

The primary physical component of the monitoring system will be the gas monitoring probes. Gas monitoring probes are already in place along portions of the north and west boundaries of the site. Most of these probes installed during the past few months are located in native soil. As the Broadway Proper and surrounding areas are further developed, more probes will be needed in native soil. The necessary probes, to be installed in conjunction with control system construction, will be provided with tamper-resistant covers, and spaced approximately 100 feet apart on the site perimeter. Probes will also be constructed at other locations where methane migration into non-refuse fill areas might occur*

While these probes will provide the principal evidence of control system effectiveness, other monitoring, including gas detectors or Monitors within structures or utility corridors will be included in the monitoring program. Control and monitoring

systems within individual buildings .or structures will require design on an individual basis. Methane concentrations of gas withdrawn by active systems, if such systems are installed, will also be monitored.

MONITORING PROCEDURE

Methane concentrations at all monitoring points will be measured, using a combustible gas analyzer or other indicator acceptable to the State Health Department and capable of measuring methane gas in both the high range (0 to 100 percent) and the low range (0 to 5 percent). The low range permits precise measurement of small amounts of combustible gas up to the LEL for methane.

Following installation of the probes and while making the adjustments necessary to establish landfill gas migration control, the monitoring points will be monitored once each day at approximately the same time. Gas concentrations at monitoring probes will fluctuate due to weather conditions (barometric pressure, temperature, wind, etc.); diurnal fluctuations are normal. Taking measurements in the late afternoon Is generally recommended, since there are fewer variations in gas movement at that time.

Once gas migration control has been established, the probes will be monitored once each week for a month, once each month for the next quarter, and quarterly thereafter, unless site conditions change or unusual monitoring data are gathered. Quarterly monitoring will continue indefinitely unless the consultant determines that adjustments of the control system are required. If adjustments are necessary to maintain control, monitoring frequency will be on a daily basis until control is accomplished, then scheduled as described above.

The monitoring schedule, to remain flexible, will be evaluated after the first month of monitoring, at the end of the first quarter, and quarterly thereafter. The schedule will be adjusted by the consultant if weather conditions or monitoring results change; monitoring frequency may be increased if gas migration is detected, and decreased if no gas is present. The monitoring schedule will also be adjusted to ensure that at least one series of measurements takes place following frequent rainfall occurrences when ground cover on the site will retain more moisture.

The person designated to perform the monitoring will be thoroughly familiar with the system design and the instruments to be used, and will demonstrate proficiency in their use and calibration. He will also be instructed in the monitoring program's importance to the safety of the public and the intended function of the gas control system.

Data to &be recorded in the monitoring program will include:

- For All Systems:

  - date and time of measurement
  - concentrations of methane at the probes
  - weather conditions

- For Active Systems:

  - concentrations of methane and oxygen at designated points and at the blower
  - gas withdrawal flow rate at inlet to blower
  - gas temperature at designated points
  - blower pressure at inlet
  - blower operation - hours of operation

Results of the monitoring will be promptly. reported to the parties designated to evaluate each series of measurements. including the consultant, the State Health Department, and the City of Tucson. Any significant changes will be verified by remeasuring the probes in question. If it appears after remeasurement that the control criterion of 5 percent methane at the property boundary is being exceeded, steps will be taken to increase the degree of control. Increased control will, if appropriate, be accomplished by extending an existing system or activating the active control element of a system. if such a capability was included in the design.

C. PLAN IMPLEMENTATION

In this section, the various elements of the Master Methane Control Plan are coordinated, and procedures are suggested for implementation of the recommended action programs. An organizational structure will be established to manage the Plan and to evaluate its effectiveness in meeting the stated objectives. The organization will be provided with the authority and the funding to oversee and manage the maintenance and operation of gas control systems,, monitoring programs, and other elements of the Plan to ensure compliance with applicable regulations and to protect property and the public health and safety.

IMPLEMENTING ORGANIZATION

Implementation of this Plan shall be in accordance with various City of Tucson ordinances, building codes, and adopted redevelopment plans. The Broadway Proper Owner's Association (BPOA) is assigned the responsibility of managing the Plan.

Within the BPOA, second tier subgroups or organizations of building and property owners will be established to maintain elements of the Plan of a more localized nature, such as gas control systems designed to protect a single building or group of buildings. Funding for these organizations and their activities is discussed in other documents.

In the interim and until this organization is established. Decker Land Developers, Inc. will be responsible for coordinating and implementing the elements of the Plan.

It is anticipated that committees will be formed within the association to receive delegated assignments, and that one such committee, the Development Committee, will be assigned the authority and responsibility to implement the Master Methane Control Plan. A consultant, knowledgeable in the areas of refuse landfills, methane control procedures and

land use of completed landfills will be retained to advise and assist in administering the Plan.

DEFINITION OF RESPONSIBILITIES

The BPOA will be responsible for overall coordination of the development of the site and the elements of this Plan. Among the duties anticipated are:

- Establish policy, design criteria, and review procedures
- Conduct meetings of consultant(s) and management
- Retain professional staff for operation and maintenance of control systems
- Maintain liaison with appropriate public agencies
- Establish site data bank and information exchange
- Keep abreast of site conditions and construction activities
- Obtain legal counsel
- Schedule work and administer contracts
- Develop safety procedures
- Evaluate monitoring program results
- Prepare annual program and budgets
- Evaluate effectiveness of programs and obtain modifications, where necessary
- Review proposed facilities and services for conformance with the Master Plan

ARIZONA DEPARTMENT OF HEALTH SERVICES

BRUCE BABBITT, Governor
LLOYD F. NOVICK, M.D., M.P.H., Director

September 17, 1984

Mr. Luis G. Gutierrez
Assistant City Manager
City of Tucson
P. O. Box 27210
Tucson, Arizona 85726-7210

Re: Broadway Proper Master Methane Control Plan

Dear Mr. Gutierrez:

The staff of the Solid Waste Unit have reviewed the Master Methane Control Plan developed by EMCON Associates and submitted by Decker Land Developers, Inc. We find this master plan to be acceptable as a flexible framework for responding to the various landfill gas hazards or problems which could arise at the former landfill site.

It appears the authors of this plan prefer a concept of active control and mitigation of landfill gas generation and this attitude is commended by this Department.

Sincerely,

Chris McCann

Chris E. McCann
Environmental Engineering Specialist
Central Regional Office - Solid Waste
Office of Waste and Water Quality Management

CEM:dp

cc: Jack Siry
Ted Decker

State Health Building 1740 West Adams Street Phoenix, Arizona 85007